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Volume 6 - Number 4

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WORLD'S POULTRY SCIENCE JOURNAL

Volume 6 October-December Number 4

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PRELIMINARY ANNOUNCEMENT — NINTH WORLD'S POULTRY CONGRESS

The Preliminary Announcement of the Ninth World's Poultry Congress has just appeared. Many countries have set up World's Poultry Congress Committees. The chairman, or secretary, of such committees should request a supply of these announcements for distribution in their country. In countries not so organized the director or head of the poultry department of colleges or universities should take this responsibility. Members of the World's Poultry Science Association can also be of help in this respect.

The Preliminary Announcement can be obtained from M. Paul Waroquiez, Secretary-General, 9th World's Poultry Congress, 8 rue d'Athenes, Paris (9), France.

THE SORBONNE—PARIS

The meetings of the Ninth World's Poultry Congress will be held here.

NINTH WORLD'S POULTRY CONGRESS

The Ninth World's Poultry Congress will be held in Paris, Aug. 2-9, 1951. I'm pleased to inform you of particulars about this Congress.

The President of the Republic has accepted the Presidency, and will preside personally at the official banquet, which will bring together all Congress Members. He will accord us, moreover, the great honour of receiving the heads of the world's delegation in his Palais de l'Elysee.

Mr. Pflimlin, our Minister of Agriculture, has accepted the Honorary Presidency, and will personally preside at the opening meeting of the Congress, which will be held in the Great Ampitheatre of La Sorbonne, University of Paris. He honoured me by naming me as chairman of the Organizing Committee. It's also in La Sorbonne that all the meetings of the Congress will be held.

Our government has officially invited 66 nations to participate at the Congress. Some weeks ago Mr. Termohlen President of the World's Poultry Science Association, together with Major MacDougall, secretary, came to Paris. During several meetings, we have been able to draw up a detailed programme of the Congress.

This programme includes 5 general papers that we have judged particularly important:

La peste aviare by Professor Lesbouyries, France.

Cooperatives of Production, by Mr. Hogbro Holm, Denmark.

Technical developments in the storage and marketing of eggs by Professor Brooks, England.

The significance of crude fibre in poultry nutrition by Mr. Brendan, Eire.

Recent advances in developing superior laying and meat producing strains by Professor Jull, United States.

The Congress includes, moreover, 5 sections:

I —Genetics and incubation
II —Nutrition, physiology, and rearing
III—Investigation of disease and their control
IV—Economic problems including marketing
V —Education and organization

Each nation may present papers on these subjects. They ought to include about 1,500 words, but not more than 2,000. These papers should be presented to the National Committees

by January 20, 1951, and should reach the Secretariat of the Congress by February 10, 1951.

A World's Poultry Exhibition will be organized in the Grand Palais, which is situated in the Center of Paris, on the Champs Elysees. This Exhibition will include chickens, turkeys, ducks, geese, guinea fowls, pigeons and rabbits.

The entries of young subjects or of adults will consist of 1 male and 3 females for hens, ducks, geese, turkeys, fowls, guineas, and rabbits. For pigeons the entries will consist of 2 pairs. The subscription fee, for each entry, is 300 French francs, and for each unit, male or female, 100 French francs. Entries must reach the Secretariat-General of the Congress, 8 rue d'Athenes, Paris, before the 1st of June, 1951.

The Exhibition will also comprise displays of poultry materiel, food, and poultry veterinary products. Those who are interested may obtain space for the fee of 1,000 French francs per square metre. Special membership forms will be sent in good time to the National Committees.

During the Congress, great evening receptions will be held, particularly one at the Town Hall of Paris, by the Lord Mair of Paris. We have also provided visits of poultry farms near Paris as well as visits of the Chateau de Versailles and other well-known historical places.

At the end of the Congress, trips will take place, across France, which will last a week or a fortnight. Five of these trips will be provided across different parts of France. Congress Members will be received by personalities of the towns or centers they will cross. Thy will visit great poultry farms, manufactories and centers known in the whole world.

The first trip will cross Normandy and go to Brittany as far as the Atlantic, to the landing beaches.

The second trip will cross the center of France, particularly the region of Vichy, will go to Charentes Maritime, this country where la Marandiase, the breed whose eggs are so big and reddish, is bred, and afterward will go to Bordeaux and Toulouse.

The third will pass through Bourgogne and go to Lyon and Marseille, and from there to Cote d'Azur and Nice.

The fourth trip will go to the East of France, particularly across the plain of Alsace to Strasbourg, and on going back, will cross Loraine.

The fifth trip will go across Somme, particularly by the battlefields of the Great War of 1914-18, and will go to the North of France.

The particulars of all these trips together with their prices and subscription rates will be subsequently given, to the National Committees.

After Holland, Spain, Canada, England, Italy, Germany, United States of America and more recently Denmark, France is happy and honoured to receive delegates of the whole world, who are interested in Poultry Husbandry.

I am happy, in the name of the Organizing Committee to welcome them heartily, and I feel sure, that they will keep an unforgettable memory of the Congress in Paris and of their journey in France.

Alex Wiltzer,
President of the 9th
World's Poultry Congress

THE GRAND PALAIS—PARIS

The Exhibition to be held in connection with the Ninth World's Poultry Congress will be held in this building.

INDICATED 1950 WORLD EGG PRODUCTION

The production of eggs during 1950 by major producing countries* is indicated at approximately 5 percent above last year according to information available to the Office of Foreign Agricultural Relations. The indicated 1950 level of production will exceed the average prewar output of these same countries by about one-third largely due to the 66 percent increase in the United States which accounts for approximately one-half of all the reported egg output. The egg production for all reporting countries excluding the United States is almost 10 percent above their comparable prewar average. There is some indication that smaller world-wide gains in egg production will be made in the next few years since the United States output is at a record level and most of the European countries have substantially recovered from their World War II deficits.

The 1950 increases have been the result of both higher chicken numbers in almost every country during 1950 owing to the large hatch in 1949 and the better rate-of-lay in a number of countries over last year due to improved quality of birds and better feeding.

Profits to egg producers have been smaller in 1950 as in most instances feed and labor costs have remained steady or increased while at the same time prices paid for eggs have declined in almost every country. The higher feed prices are of particular hindrance to feed importing countries, in many of which effort is made to keep the size of flocks in direct proportion to the amount of feed that can be home grown by the poultry keepers. This policy has succeeded in utilizing more indigenous feed but also has limited specialized enterprises and given rise to increased seasonality in the supply of eggs. Practically all ceiling price controls and rationing have been replaced by price support programs for producers, and in efforts to provide both export and domestic markets. This situation has resulted in a smaller hatch during 1950 in several countries, but may not necessarily mean fewer eggs as an increase in the rate-of-lay could easily offset the smaller number of hens.

The United States output of eggs is expected to increase by 4½ percent in 1950 above 1949, while Canadian production is estimated at slightly over 3 percent above last year.

* This report includes countries for which information is obtainable as indicated by the accompanying table.

Practically all Western European countries made much larger gains. Particularly large advances in egg production are indicated in the Netherlands, the United States, British and French zones of Germany, Finland, Denmark, Czechoslovakia and Austria. The export of eggs is increasing as major suppliers such as the Netherlands, Denmark, Hungary, Turkey, Poland, Australia, Sweden, Ireland, China, and Belgium make large shipments and minor exportations are made by France, Norway, and others not normally considered net exporters of eggs. Several Balkan countries are now experiencing their first good year, and there is no reporting country where egg production is still depressed as a result of World War II.

A smaller output of eggs is expected in both Switzerland and Australia for 1950 as compared to 1949 due to the pessimistic outlook for producers in these two countries.

United States egg production the first eight months of 1950 was 7 percent above last year but the increase for the whole year will not be as large. The much smaller hatch this year will limit the number of pullets laying in the last months of the year. The egg prices received by poultrymen thus far in 1950 have been considerably below the 1949 level and are not apt to make more than seasonal gains in the remainder of the year.

The Canadian poultrymen were extremely pessimistic at the beginning of the year since they lost the United Kingdom market, their principal export outlet. However the Government price support program instituted late in January and the increase in domestic consumption by about 13 percent has provided a relatively stable domestic market. No surpluses are expected as storage eggs will probably move out in the short season. Exports are much smaller than in 1949 and mainly to the United States. The 1950 hatch was 18 percent below a year earlier, leaving fewer pullets to start the 1950-51 laying season.

The Cuban egg production has been increasing in line with the Government interest and desire to encourage domestic production to the extent of supplying local needs through improvement in production methods and providing a profitable market with import regulations. Improvement in methods of marketing will assist materially.

The Argentine poultry industry has been hindered by high feed costs due to the smaller indigenous grain crop of 1950. No eggs are available for export as domestic demand

has raised local prices above the international market level. Egg production during the flush season has not even been large enough to permit as many for storage as the Government would like for domestic needs during the off season.

The Netherlands egg production for 1950 is estimated at about 22 percent above 1949. Stocks however are much smaller than in 1949 due to the larger exports which now account for over one-half of the production. Western Germany is the principal destination of export shipments and this market is expected to remain stable at a price level higher than quoted for a considerable portion of earlier exports to other countries. The higher export prices have strengthened the prices in domestic markets where purchases have been smaller than the comparable period a year earlier. Sales to the United Kingdom have been temporarily withheld as the two countries could not agree upon a price at the time of negotiating the June 5th trade agreement. The incidence of Newcastle disease has been brought under control.

The Danish trend in egg production continues upward with an increase of 13 percent in 1950 over 1949. The United Kingdom continues to purchase approximately 80 percent of the exports under long term agreement but at prices regarded by Denmark as unfavorable to their poultry industry. Western Germany has been a favorable market. Feed supplies have been adequate.

The Irish rate of increase in egg output has fallen off from the approximately 20 percent in 1949 over a year earlier to about 6 percent in 1950 over last year, as the production nears the prewar level. Poultrymen have become doubtful of prospects for profitable trade with the United Kingdom as the price during the flush season dropped from about 34 cents to 28 cents per dozen. The United Kingdom contract, however, does specify a price of almost 50 cents per dozen during the season of low production which might be encouraging and possibly have considerable effect on leveling out the high seasonal production of Ireland. Rising cost of imported grain has become a limiting factor to some poultry keepers and there is considerable effort being expended to utilize home grown feeds.

Sweden: The anticipated 6 percent increase in the production of eggs in Sweden during this year over 1949 will put the egg output at a level 80 percent above prewar. The domestic consumption of eggs is the highest on record for Sweden and exports are at prewar levels. Prices received by poultry-

men have declined and feed supplies are adequate. The flocks are healthy and relatively free of disease.

The Swiss poultry industry is having difficulty meeting the lower prices of imported eggs from countries that have devaluated their currency even though domestic prices received by farmers is aided by small compensation payments. Swiss officials warn against the establishment of any new poultry enterprises or expansion in old flocks. Domestic consumption has increased as a result of lower retail prices. The number of laying hens as of April 1949 and 1950 was about the same. Swiss egg production is about 13 percent above the average prewar level.

Norwegian egg production for the year 1950 will be about 9 percent above 1949 and 11 percent above the prewar average. Rationing of eggs to consumers was discontinued in June 1950 and the first postwar exports were made in the same month. Norway does not favor subsidizing of poultry feed for the production of eggs for export as poultrymen feel the foreign market is unreliable. Some effort is being made to provide storage facilities for eggs during the season of high production as considerable seasonality developed during the operation of postwar controls for encouraging output. Eggs are receiving more competition from other foods in the market place and the margin between costs and sales prices is continuing to decrease. This is expected to limit the hatch in 1950 to about one-half the number of chicks hatched in 1949.

Egg production in *France* has increased 6 percent above the prewar average due largely to an improvement in husbandry practices and better supplies of feed. Chicken numbers are still estimated at about prewar levels. The large production of eggs has caused 1950 prices to fall below those existing for comparable periods during 1949 but consumption has increased only slightly. This situation has made supplies available for export and France is currently a net-exporter of eggs. Prices paid to poultrymen have not been particularly encouraging but it is quite possible that production will continue to increase with improvement in rate-of-lay.

Production in *Finland* during 1950 which is estimated at 13 percent above 1949 will be only about 6 percent below prewar. Indigenous egg output in 1950 exceeded domestic purchases for the first time in 10 years. Prior to World War II 45 percent of the Finnish production was sold on foreign markets and considerable effort has been made to resume exports. The government has begun subsidizing exports to encourage

EGGS

Number produced[1] in specified countries, average 1934-38, annual 1946-49

Country	Average 1934-38	1947	1948	1949	Indicated 1950
	Millions	Millions	Millions	Millions	Millions
North America					
Canada	2,638	4,484	4,274	3,774	3,900
Panama	——	52	——	54	55
United States	35,498	55,252	55,158	56,382	59,000
Cuba	320	288	276	318	325
Dominican Republic	——	60	——	——	——
Europe					
Albania	143	——	——	——	——
Austria	663	285	350	400	450
Belgium	1,693	1,250	1,300	1,500	1,600
Bulgaria	682	——	——	——	——
Czechoslovakia[2]	1,958	903	1,110	1,380	1,560
Denmark	1,979	992	1,392	1,870	2,112
Finland	317	117	176	266	300
France	6,200	6,300	6,100	6,800	7,200
Germany (Tri-zone)	3,700	1,976	2,250	2,800	3,600
Greece	550	376	384	390	410
Hungary	1,050	650	750	——	——
Ireland	1,086	733	844	1,014	1,080
Italy	5,600	4,300	4,450	4,550	4,650
Luxembourg	40	30	35	40	40
Netherlands	1,978	1,052	1,159	1,480	1,800
Norway	369	198	276	375	410
Poland and Danzig	3,500	——	——	——	——
Portugal	250	——	——	——	——
Rumania	1,500	——	——	——	——
Spain	1,700	1,992	1,800	1,860	1,900
Sweden	900	1,217	1,335	1,555	1,656
Switzerland	423	442	520	559	530
Unit. Kingdom—Farm[3]	[4]3,871	2,600	3,000	3,500	4,300
Total[3]	[4]5,098	4,000	4,300	5,000	5,750
Yugoslavia	1,000	——	——	——	——
Asia					
Lebanon	——	60	48	42	——
Palestine	108	——	——	——	——
Syria	92	90	110	120	——
Turkey	1,003	——	895	950	1,000
Japan	3,553	——	——	——	——
India	——	——	——	1,085	——
Pakistan	——	——	334	——	——
Philippine Islands	645	——	605	645	675
South America					
Argentina	1,127	——	——	——	——
Brazil	——	——	2,160	——	——
Chile	——	460	370	——	——
Paraguay	——	100	——	——	——
Uruguay	289	326	330	300	——
Africa					
Egypt	751	——	——	——	——
French Morocco	1,000	——	——	——	——
Union of South Africa	——	372	——	1,200	1,160
Oceania					
Australia[5]	708	1,470	1,431	1,443	1,392
New Zealand	403	——	——	450	460

[1] Relates to farm production in Canada and the United States, but data for many countries not explicit on this point. [2] Postwar numbers possibly under reported. [3] Year ending May of year indicated. [4] 3-year average. [5] Commercial production for year ending in June of year reported.

Office of Foreign Agricultural Relations. Prepared or estimated on the basis of official statistics of foreign governments, reports of U.S. Foreign Service officers, results of office research, and other information. Data relate to prewar boundaries unless otherwise noted.

production and thereby expecting to offset considerable reductions in domestic prices. Egg output in *Poland* is increasing and much attention is being directed towards improving the assembly of eggs and in securing export markets.

The United Kingdom supply of eggs has increased due to higher production and greater imports to the extent that consumer prices were lower during the flush season. Retailers were allowed to sell eggs to other than regular buyers after registered customers had an opportunity to secure their allocation. The government has continued to guarantee relatively high prices for eggs to farmers and subsidize prices to consumers. Feed subsidies were eliminated.

Austria and Czechoslovakia are making more pronounced recovery with improved feed supplies and in another year can be expected to be very close to the prewar level.

New Zealand egg production increased slightly during 1950 as feed supplies are somewhat better and there have been a few additional family size flocks. Supplies will still be short of domestic purchases.

Output of eggs in *Australia* in the first half of 1950 was slightly less than the first 6 months in 1949. Rising costs made it difficult to derive a profit from prices specified in the long term United Kingdom contract which is important as one-third of the production is for export. (Foreign Agriculture Circular FPE 4-50, September 18, 1950. Office of Foreign Agricultural Relations, U.S. Dept. of Agr., Washington, D.C.)

BREEDING FOR RESISTANCE TO DISEASE

Considerable progress has been made in recent years in the field of breeding disease-resistant chickens. The Auburn strain of White Leghorns, developed by the Alabama station through selective breeding to decrease adult mortality, shows excellent possibilities. During the past year pullets of this strain that were hatched and raised in comparison with outstanding American strains from California, New York, Florida, and Minnesota, were far ahead in livability and second in rate of lay. The adult mortality of unculled females from 5,000 pedigreed chicks grown to maturity and trapnested for 1 year was only 18 percent, the lowest since the project started 14 years ago. The hens averaged 202 eggs each, next to the highest production ever attained at the Alabama station.

FOWL-TYPHOID-RESISTANT LEGHORNS

Cross-breeding of strains of birds that were resistant to and susceptible to fowl typhoid showed that the factors for resistance that were segregated in the third generation displayed partial dominance. From these segregates resistant lines were formed that were closely similar to the susceptible birds in their other characteristics. The genetic resistance of White Leghorn lines developed at the Iowa station was shown to be transmissible to other commercial stocks. The commercial importance of fowl typhoid led hatcherymen to request the station to make its method of selecting strains available to them. They have sought the most resistant strains in their flocks and are now breeding from these families to establish better stock as source material for their hatcheries. Crosses with the station's resistant strains were utilized to introduce resistance into other strains.

Of especial value is the finding that genetic resistance to fowl typhoid is closely associated with a higher-than-average body temperature. Resistant strains consistently evidenced normal temperatures from 0.2° to 0.4° C. higher than susceptible strains. It was noted that resistance is lowered within both resistant and susceptible strains when body temperature is reduced by brooding at low environmental temperatures.

RESISTANCE TO COCCIDIAL INFECTION

The Hawaii station is using genetic principles in an attempt to increase the resistance of chickens to coccidial infection. It has developed resistant and susceptible lines. The Hawaii station workers artificially inoculated 14-day-old chicks from matings within the two lines with approximately 125,000 sporulated oocysts. They recorded chick mortality due to infection from 4 to 10 days after the inoculation.

The chicks from the specially selected strain proved to be much more resistant to protozoan *Eimeria tenella* than did the chicks from the susceptible strain. Of the former, 80.7 percent survived. Of the latter, only 14.5 percent lived. The difference in resistance was 66.2 percent. In continuing this study the Hawaii workers are testing chicks from other nonprogeny-tested males and females from the two lines, as well as chicks from parents that are entirely unrelated to the stock developed in this project. (Office of Agricultural Experiment Stations, U.S. Dept. Agr.)

TOM NEWMAN MEMORIAL AWARD

This international award which was set up by POULTRY ASSOCIATION OF GREAT BRITAIN in commemoration of Tom Newman, for many years secretary of the Association has just been awarded in respect of Research work published in 1949 to Dr. Fred R. Beaudette, New Jersey Agricultural Experiment Station, New Brunswick, New Jersey, United States of America.

The Award was made to Dr. Beaudette for his outstanding research work on poultry pathology as evidenced in the papers cited below:

An Addendum to a Review of the Literature on Newcastle Disease.

Twenty Years of Progress in Immunization Against Virus Diseases of Birds.

The Failure to Recover Newcastle Virus by Egg Inoculation of Dilutions of Organ Suspensions.

Newcastle Disease Immunization with Live Virus.

A Comparsion of Filtration and Antibiotic Treatment for the Recovery of Newcastle Virus from Spontaneous Cases.

Dr. Beaudette has thrown his full energies into his lifelong work with poultry diseases. Graduated as a Doctor of Veterinary Medicine from Kansas Agricultural College in 1919, he went to Rutgers University as an assistant professor in 1923, becoming a full professor in 1929. Two of his discoveries in recent years have been the development of an effective live virus vaccine for immunizing poultry against laryngotracheitis, and the discovery of a similar vaccine to control Newcastle Disease.

THE VITAMIN A NEEDS OF POULTRY

Vitamin A is absolutely essential in poultry feeds. The approximate 1.5 billion chicks hatched annually in the United States require over 150,000 billion units of vitamin A, or the

quantity contained in 55 million gallons of cod-liver oil. Due to decreasing production of fish-liver oil, vitamin A from this source is becoming scarcer. Unfortunately both vitamin A and carotene are extremely liable to oxidation, especially during hot summer months. Consequently, large percentages of these nutrients are lost from their carriers or the feed mixtures before they are fed. Therefore, any information on the utilization on vitamin A precursors by poultry, and on the preservation of both vitamin A and carotene, is of great value to the poultry industry.

VITAMIN A REQUIREMENTS VARY

The Nebraska station compared the growth-promoting value of three alfalfa products for both chicks and poults. The station showed that, with present unit cost of vitamin A, dehydrated alfalfa meal was much superior to sun-cured meals. These experiments also brought out the interesting observation that White Rock chicks apparently needed a significantly higher amount of vitamin A activity than did New Hampshire chicks on the same diet.

EARLY USE OF MIXED FEEDS IN HOT WEATHER RECOMMENDED

The Oklahoma station found that the use of antioxidants reduces the loss of vitamin A and carotene in mixed feeds during hot summer weather, but not enough to be of economic importance. Cold storage and sealed containers were effective in preventing vitamin losses in mixed feeds. Neither pelleting of feed nor coating it with cellulose acetate proved effective in preserving vitamin A. Young, succulent, green feed, either freshly cut or prepared as silage, proved to be an excellent source of vitamin A for poultry. The Oklahoma station recommends that poultry feeds be used within 2 weeks after mixing to reduce loss of vitamin A potency.

TEMPERATURE EFFECTS ON DEHYDRATED GRASSES AND LEGUMES

The Maine station placed dehydrated samples of grasses and legumes in tightly closed glass jars. These were kept in the dark for 1 year at respective temperatures of 75° to 85° F., and at 32°. Half of the samples had been blanched with live steam before drying. The samples held at 32° lost a small amount of carotene. Those held at room temperature lost most of the carotene. There was little difference in the average loss from blanched and unblanched samples. (Office of Agricultural Experiment Stations, U.S. Dept. Agr.)

VITAMIN B_{12} AND OTHER B-COMPLEX FACTORS IN POULTRY NUTRITION

Feeding chickens in order to get results in the form of eggs and meat requires adequate knowledge of the principles of nutrition. The agricultural experiment stations as well as the Department are annually contributing a sizable amount of new knowledge in this field.

MARYLAND POULTRY RESEARCH HELPS ISOLATE CRYSTALLINE B_{12}

One of the most important announcements in the field of nutrition in 1948 concerned the isolation of B_{12}, the new vitamin that shows promise in combating pernicious anemia in man and in improving human nutrition, as well as improving the nutrition of livestock and poultry. The microbiological work that led to the preparation of this new vitamin in crystalline form was done by the poultry department of the Maryland station.

RELATIONSHIP OF VITAMIN B_{12} TO ANIMAL PROTEIN FACTOR

At most stations research on vitamin B_{12} during the year was carried on with B_{12} concentrates. The problem now is to obtain the pure crystalline form of this vitamin in sufficient quantity to carry on comparative research. The Wisconsin station found that pure vitamin B_{12} can apparently replace the animal protein factor activity of condensed fish solubles and injectable liver preparations. Vitamin B_{12} administered orally or parenterally completely counteracted a thyrotoxic condition in chicks produced by feeding a diet containing iodinated casein.

Results of experiments carried on by the Idaho station showed that the B_{12} concentrate used in the study was as capable of promoting chick growth and hatchability as several crude sources of the animal protein factor.

POSSIBLE RELATIONSHIP BETWEEN B_{12}, CHOLINE, AND BETAINE

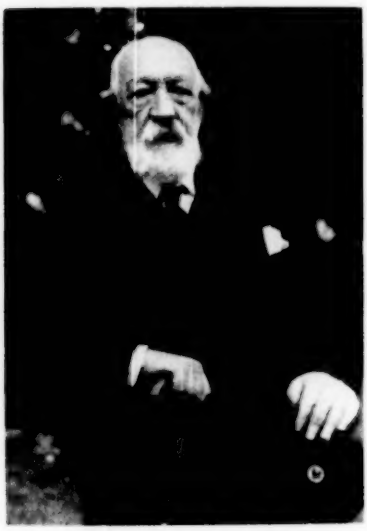
The New York (Cornell) station has developed an improved method for the determination of vitamin B_{12} microbiologically and a successful procedure for making highly purified preparations of vitamin B_{12} free of other unidentified vitamins required by the chick. It has gathered evidence that an interrelationship exists between vitamin B_{12} and two other nutritive factors, choline and betaine. In the presence of vitamin B_{12} the amount of either of the latter factors required in

the diet is greatly reduced. The amount of vitamin B_{12} required by the chicks fed the New York experimental diets appeared to be between 1 and 2 micrograms per 100 grams of feed. Since the chicks used in the studies were depleted of their vitamin B_{12} reserves, it is probable that the requirement of normal chicks is somewhat less than this. (Office of Agricultural Experiment Stations, U.S. Dept. Agr.)

IN MEMORIAM

PROF. SALVADOR CASTELLO CARRERAS—Director of the "Spanish Royal Poultry School" of Arenys de Mar, died on February 17th, 1950, being 87 years old, of which more than sixty were dedicated to the advancement of the poultry industry.

D. Salvador Castello represented Spain at the First World's Poultry Congress at the Hague in 1921. He was also present at the Congress in Ottawa in 1927, London in 1930, Rome in 1933 and Leipzig in 1936.



He was Director and President of the Executive Committee of the Second World's Poultry Congress held in Barcelona, Spain in 1924.

Professor Castello became a member of the World's Poultry Science Association in 1921. He was a member of Council for Spain from 1921-1925. He was elected Vice-President in 1925 and for many years was First Vice-President for Continental Europe. In 1948 he was elected Honorary Past Vice-President. He was also an Honorary Life Member of the Association.

He has published many poultry works in the Spanish language through which he is known by the world's poultrymen. He gave short courses of aviculture in Mexico, Argentina, Uruguay and Chile and in his travels through the latter country in 1914, discovered the hens named by him "Gallus Inauris" remarkable for the blue color of their eggs, and which he made known at the Congress in 1921.

CURRENT POULTRY AND EGG SITUATION AND OUTLOOK

Poultry is an important industry despite the limited attention which it is given by most countries. Poultry and eggs are produced everywhere in the world, and people are using such products increasingly in their diets. In the United States, for example, the per capita consumption of protein derived from poultry meat and eggs in 1948-49 amounted to about 15 percent of the per capita consumption of all animal protein. In Canada and France the corresponding figure was 14 percent; and for all of Western and Central Europe it was about 8 to 10 percent.

Poultry farming as a specialized commercial agricultural business is found primarily in countries with abundant grain production, such as the United States, Canada, and Australia. It is also found in countries with relatively high standards of living and possibilities for large grain imports, such as the Western European countries. In countries with small grain supplies, poultry is maintained mostly as a supplementary enterprise; China, Japan, Italy, and Greece, for example, have few commercial poultry businesses. In such countries, poultry production is a "back-yard" industry, conducted on a scavenger basis.

POULTRY NUMBERS

During the war years European poultry numbers were sharply reduced by restricted grain supplies. Owing to their dependence on grain imports, the countries where specialized commercial poultry business was most developed suffered the greatest percentage decrease. In Denmark, numbers declined by two-thirds between 1939 and 1942; in the Netherlands, from 32.8 million in 1939 to 3.9 million in 1943. In Belgium the number of laying hens fell to about 15 percent of the prewar average. In Sweden a temporary decrease of one-third by 1942 was soon overcome by better grain crops, and since then poultry numbers have continued to increase rapidly. Germany ended the war with 46 percent of its prewar numbers. In the United Kingdom the lowest point was reached in 1943, with a 34-percent decrease from the 1939 poultry numbers. The contraction in specialized poultry business in England was even more severe owing to restricted feed rations. Serious reductions took place also in the devastated countries of Eastern and Southeastern Europe, such as Poland, Czechoslovakia, Yugoslavia, and Greece.

PER CAPITA CONSUMPTION OF POULTRY MEAT AND EGGS, SELECTED COUNTRIES

(Kilograms per person per year)

Country	Eggs					Poultry Meat				
	1934-38	1945	1947	1949	1950 (est.)	1934-38	1945	1947	1949	1950 (est.)
Austria	6.1	1.9	2.0	3.5	—	1.2	0.3	0.6	0.4	—
Belgium	10.7	1.7	11.2	13.6	13.6	1.6	0.4	0.8	1.5	1.8
Czechoslovakia	6.5	2.9	3.7	—	—	3.0	—	—	—	—
Denmark	7.6	9.5	9.4	9.1	9.0	6.5	—	4.5	4.9	5.0
Finland	3.0	1.2	2.3	3.7	4.0	0.6	—	—	0.3	0.4
France	9.0	9.0	8.9	10.1	10.3	6.0	6.0	6.0	6.0	6.0
Germany	7.2	2.0	2.5	4.8	5.7	1.5	0.5	0.7	0.6	0.7
Greece	4.2	2.4	2.7	2.5	2.7	1.6	1.1	1.1	1.1	1.2
Hungary	6.4	—	2.7	—	—	2.2	—	3.5	—	—
Ireland	13.5	10.3	11.1	11.9	14.0	6.1	5.3	6.1	5.5	5.5
Italy	7.4	3.0	4.6	5.5	5.8	1.6	0.6	0.9	1.1	1.2
Luxembourg	9.3	2.0	7.3	11.0	11.0	1.0	—	0.7	1.5	1.5
Netherlands	5.2	1.4	4.6	5.7	6.0	0.9	0.4	0.6	0.2	0.3
Norway	7.2	2.0	4.2	6.1	6.6	1.0	0.3	0.5	0.8	0.8
Poland	3.7	—	4.1	—	—	0.9	—	0.9	—	—
Sweden	7.2	8.7	10.8	11.5	11.5	1.4	1.4	1.7	1.8	1.9
Switzerland	8.8	3.1	7.4	8.5	8.5	1.0	0.5	1.0	1.2	1.2
United Kingdom	11.0	5.0	7.2	10.3	10.5	2.1	1.5	2.1	2.5	—
Yugoslavia	2.1	—	2.2	—	—	1.3	—	1.3	—	—
Canada	12.3	16.5	16.4	14.2	14.4	8.2	11.1	10.8	9.5	—
United States	16.6	22.5	21.5	21.4	22.2	9.3	15.0	12.7	13.3	13.2
China	1.2	—	1.1	—	—	0.7	—	0.6	—	—
Japan	2.8	0.6	0.5	0.6	1.0	0.4	0.1	0.1	0.1	0.2
Philippines	1.1	0.3	0.5	1.3	1.4	1.9	0.2	0.3	0.5	0.6
Turkey	2.7	2.4	1.9	0.9	1.0	1.9	1.7	1.6	1.4	1.3
Australia	12.0	—	13.4	—	—	3.0	—	5.0	—	—
New Zealand	13.4	13.4	13.2	15.0	—	—	—	1.8	—	—

Recovery in poultry numbers for the European countries became generally apparent in 1946 and 1947, and advancement has been rapid ever since. For Western Europe as a whole, numbers had reached the prewar average by 1949 and have increased considerably further in 1950. The rate of recovery, however, has varied widely among the countries; it has been slowest in Germany, where grain supplies have been very short until recently.

In Asia, where the grain shortage was much worse than in Europe, the decline in poultry numbers during the war was even more severe. By 1945 Japan had only 36% of its prewar poultry numbers, and the Phillipines only 30% of its prewar numbers of laying hens. The figures for China show

POULTRY NUMBERS, SELECTED COUNTRIES: PREWAR, 1949, AND ESTIMATED 1950

Country	Time of Enumeration	All Poultry		
		Prewar	1949	1950 (est.)
Austria	Dec.	9,300	5,500	6,500
Belgium	Winter	20,000	18,360	20,000
Czechoslovakia	Jan.	38,500	16,393	17,160
Denmark	July	29,000	31,100	33,300
Finland	March	3,100	2,900	3,500
France	Fall	188,000	192,000	192,000
Germany (Trizone)	Dec.	57,500	47,000	53,000
Greece	Dec.	12,300	10,185	11,550
Ireland	June	19,500	22,163	23,000
Italy	Fall	80,500	67,840	72,000
Luxembourg	May	550	408	460
Netherlands	May	30,800	22,950	26,000
Norway	June	5,797	5,832	5,934
Poland	June	56,000	48,400	———
Sweden	Sept.	11,200	17,500	17,700
Switzerland	April	5,594	6,200	6,200
United Kingdom	June	94,600	114,200	118,000
Canada	June	62,405	69,973	———
United States[1]	Jan.	414,176[2]	454,216[2]	487,300[2]
China	———	341,000	248,000[3]	———
Japan[4]	Feb.	51,600	16,600	23,300
Philippines	Jan.	26,400	21,200	28,500
Turkey	Dec.	19,050	21,950	22,700

NOTE: For further detail on poultry numbers, see *Monthly Bulletin of Food and Agricultural Statistics*, July and August, 1950.

[1] Chickens on farms, excluding commercial broilers. Data on commercial broilers are not available for any given date; only the annual production can be obtained. Chickens not on farms (not included here) are estimated at 10 percent of the number on farms.

[2] Includes turkeys and chickens on farms. Commercial broilers are excluded, and also geese and ducks, the numbers of which are insignificant.

[3] Figures for 1947-48.

[4] Prewar numbers refer to month of July.

a smaller decline—about 30 to 35%—although little reliance can be placed on available data for this country.

The United States, soon after the beginning of World War II, in a program designed to increase food production, included both poultry and eggs in a group of agricultural products given special price guarantees. This action, together with favorable feed supplies and a strong demand for poultry products, brought about a very large increase in poultry numbers. Canada made similar gains. After 1945, a reduction occurred in these countries, in adjustment to the changing conditions as determined by demand and trade situations; but in the United States there has been an increase again during the past three years.

Poultry production in Europe has been stimulated by the much improved feed situation of the past two years. In 1949, total poultry numbers in Western and Central Europe had recovered to substantially the prewar level, and there was a further gain in 1950. Numbers of laying hens, on the other hand, were still below the prewar level in 1949, but they will probably exceed the prewar numbers in 1950. Better care and feeding have somewhat improved the rate of egg production per laying hen, and total output of eggs in 1949 was at about the prewar volume. A further gain of 10 to 15 percent seems likely for 1950.

In Eastern Europe, although data are not available for much of the region, there appears to have been a marked increase in poultry and egg output as compared with previous postwar years. For most of these countries, however, poultry numbers are probably still below prewar. In Czechoslovakia, chicken numbers at the beginning of 1950 were at only about half the prewar level. Poland, on the other hand, has made a fairly rapid recovery, and estimated number for 1950 were at about 80 to 85 percent of prewar. In Greece and Yugoslavia, numbers were nearly back to the prewar level in 1949-50, but in the Soviet Zone of Germany they were still at only about 70 percent of prewar. Available estimates of egg production in Eastern Europe place 1949 output for the eight countries of this region (excluding the U.S.S.R.) at about 90 to 95 percent of prewar. Output in Bulgaria, Romania, and Yugoslavia was probably above prewar.

In North America, poultry numbers increased in 1949 and again in 1950. The increase in the United States was general, pertaining to total poultry and to laying hens, and there was also an increase in the rate of production per laying hen.

PRODUCTION RATES—EGGS PER HEN PER YEAR

Country	1934-38	1949	1950 (Est.)
Austria	80	97	97
Belgium	118	138	140
Czechoslovakia	127	110	110
Denmark	164	152	152
Finland	117	107	----
France	87	98	103
Germany (Trizone)	101	88	105
Greece	73	59	57
Ireland	121	112	----
Italy	92	89	90
Netherlands	134	152	170
Norway	109	98	102
Sweden	123	125	126
Switzerland	100	120	120
United Kingdom	110	106	112
Canada	110	155	----
United States	97	137	140
China	70	70	----
Japan	131	81	113
Philippines	40	50	50
Turkey	64	48	50
Australia	----	----	----
New Zealand	----	----	----

a/ Data for 1950 were obtained essentially from country questionnaires received early in 1950. Because of good feeding conditions, the 1950 actual production is likely to exceed the estimates given here.

As a consequence, total egg production in the United States in 1949 was slightly above that of 1948 and 60 percent above the prewar level. The 1950 output is expected to show a further increase of about 8 to 10 percent over the previous year. Canada's output of eggs in 1949 declined by about 12 percent from the 1948 volume but was still about 55 to 60 percent above the prewar average.

The principal change in the poultry and egg situation during the past year has been the rapid increase in poultry numbers and egg output in most of Europe. This has been concurrent with a general recovery of livestock production under the influence of a good supply of both indigenous and imported concentrate feeds and favorable price relationships.

The average increase in world egg output in 1949 over 1948 was probably about 5 percent, or perhaps 10 to 12 percent for all important egg-producing countries other than the United States.

Trade in shell eggs in 1949 probably exceeded the preceding year's volume by 20 percent, largely as the result of an increased flow of eggs to the United Kingdom and to Germany from European sources.

Trade in egg products (frozen and dried eggs) in 1949 declined from the 1948 volume and was far below the wartime peak attained in 1945-46. The United Kingdom's imports of processed eggs in 1949 were about 12% below the 1948 volume and somewhat below the prewar average.

Prospects for 1950 point to further increases in total trade in shell eggs, particularly in the intra-European trade, and further declines in trade in the processed products. The United States Government is continuing to accumulate increasing stocks of dried eggs under its price-support program. Some of these stocks are expected to be sold in international trade at prices below the original costs.

The outlook for the poultry industry beyond 1950 is difficult to appraise. With normal weather conditions, there is likely to be continued expansion in production, even though per capita consumption of eggs in most of the important egg-consuming countries is near or above the prewar average. The Western and Central European countries have projected a production level in 1952 only 6% above prewar, and a few countries which expect some difficulty in disposing of small surpluses indicate some reduction in egg production from the 1950 level. It is to be expected that Canada and the United States, under peacetime conditions, will cease to be important egg exporters, but this is not likely to reduce the level of egg production significantly. (Food and Agriculture Organization of the United Nations, Washington, D.C., U.S.A. Commodity Report, Poultry and Eggs, September 18, 1950.)

POULTRY CONGRESS MEMBERSHIP

Have you sent in your Ninth World's Poultry Congress membership? There are three types: (1) *Participating member* of Congress—3500 French Francs. Entitles the holder to participate in the Congress activities and to receive the Congress reports. (*World's Poultry Science Association members are entitled to a reduction of 20%*).(2) *Wife or relatives* of the Congress member—1750 French Frances. Entitles the holder to the same privileges as (1) but will not receive the Congress reports. (3) *Absentee member*—1750 French Francs —will receive the Congress reports and other printed matter.

THE MALTESE BLACK BREED

J. CESAREO
Msida, Malta

The Maltese Black Breed was originated by the Department of Agriculture. Its development was begun in 1934 at the Government Experimental Farm with about 40 hens and 3 cocks as black as possible from Malta and the near island of Gozo. These birds were mongrels and were gathered from several farms irrespective of any type and conformation, but all of one colour, that is black.

After they started laying, individual records of egg production were begun. All selected eggs were set in incubators and the chicks which hatched, were all sorts of colours. As many as possible were hatched during that year, in order to have a good number to choose the best black colour in either sex.

It is interesting to note the fancy colours of the offspring, black and white, brown, brown and white, and andalusian colors. Some of them had tufts of white feathers on their heads like Polish and houdans. The tail was either carried straight, leaning forward towards the head or carried backwards. Legs were, black, yellow, green or mottled.

After we had results of egg production and hatching we began to work on the selection of birds to standardize the type of hen for a breed. We chose the best cockerels and pullets hatched from the best hens having the highest records. This was the first and most important thing we were after.

The general characteristics looked for were as follows:

(a) The cock or hen with absolute black feathers with a green sheen. Not even a part of a feather either red or white was permisssible.
(b) Under colour of feather pure black.
(c) Cock's comb straight, large with five serrations.
(d) In the case of hens the comb falls on one side, but not to obstruct the eye.
(e) Eyes large and prominent.
(f) Earlobes round, white, smooth and free from folds.
(g) Legs black or slate and featherless.
(h) Tail carried at an angle of 45 degrees.
(i) Eggs white in colour.
(j) Weight 5½ to 7 lbs. (cock)
Weight 4½ to 6 lbs. (hen)

Selection was continued for four consecutive years, and the bird was improving in colour and type. Egg production went up from 120 to 170 a year. We had also two pens of ten hens each which laid over 200 eggs a year. It has to be noted that although we went through these years by only intermating, yet the birds remained as hardy as ever.

In 1939 Minorca eggs were imported from England and the cockerels and pullets hatched from these eggs were crossed with our hens and cocks. By doing this we improved on the bird's colour, whitening of the earlobe and egg size. In 1948 the Department imported a dozen Minorca cockerels for putting new blood in the birds.

This breed is somewhat nervous and very hardy but a good layer. Cockerels, pullets and hatching eggs have been sent to Tripoli, and another consignment of hatching eggs is being despatched to Cyprus. Eggs in general weigh on an average from 2 to 2¼ ozs., but those kept for hatching weigh 2½ ozs.

FACTORS IN SOIL FOR GROWTH AND REPRODUCTION OF CHICKENS

Substantial growth response when top soil was added to a chick ration deficient in unidentified growth factor indicated that a factor necessary for chick growth was present in the soil. Studies at the Washington station in cooperation with the Western Regional Research Laboratory of the Department, demonstrated that many different bacteria, besides *Bacillus subtilis*, produce the chick-growth factor in highly significant quantities and that they might be used commercially in its production. Tests of commercial fermentation residues showed that a number, some of them by-products of streptomycin production, are potent in the chick-growth factor and may promote growth as effectively as a practical chick diet or as a supplement of liver or fish meal. Other preparations had no value or even had a depressing effect when added to chick diets. Proper use of commercial fermentation concentrates now on the market may enable the replacement of expensive supplements as fish meal and liver meal in practical poultry rations, effecting savings of about $4 to $5 per ton on the basis of current costs. (Office of Agricultural Experiment Stations, U.S. Dept. Agr.)

POULTRY HOUSE FAN VENTILATION

C. N. TURNER
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Poultrymen will gain many advantages from a satisfactory ventilation system. Tests under actual farm conditions by the Farm Electrification Research Council at Cornell during the past five years have shown that fan systems really perform.

Research shows that good poultry management must be followed if the fan system is to be effective. This includes:

1. The proper number of birds for the available floor area. 2. The elimination of spilled water at the drinking fountains. 3. The closing of windows near the outtake fan. 4. Insulating cold floors. 5. Adequate land drainage under the concrete floors.

The size of the laying house will dictate the size of the fan and its capacity. A fan's capacity depends on the number and pitch of the blades and speed as well as the diameter. Poultrymen, therefore, should always use the manufacturers' rating in selecting a fan.

The capacity of the fan needed for different floor areas is shown in table 1.

The fan should be installed in the sidewall of the building away from the prevailing wind if possible. It should be installed near the ceiling with a short duct which extends to within 20 inches of the floor so that the coldest air near the floor will be removed. The fan duct should be at least twice the area of the fan circle.

The arrangement and size of the intakes is important to thoroughly distribute and mix the incoming fresh, cold air. Intakes are recommended with an inside area of 60 square inches—they may be 3 by 20, 4 by 15, or 5 by 12 inches. With the intakes near the ceiling, the cold air is immediately mixed with the warmest air in the pen, and also drafts on the birds are prevented. One intake opening should be provided for each 250 square feet of floor area. Intakes should be located uniformly around the walls of the pen but not within ten feet of the fan.

The fan system was studied at the Poultry Research Farm during the past five seasons. One of the coldest periods was during the 1945-46 season when the outside temperature averaged 12 degrees during a week. Inside, the pen temperature averaged 29 degrees for the same period. Even during the

coldest days the temperature in the pen averaged 12 to 14 degrees higher than outside.

At the Poultry Research Farm the windows are closed in November, fans started, and no further attention is given the ventilation problem until the following March. The fans will pay for themselves in the labor saved during one or two laying seasons.

TABLE I

Selection of Fan and Intake Openings

Floor area (sq. ft.)	Fan Delivery* (cu. ft. per min.)	Approx. Fan Diameter(in.)	Size of Duct (in.)	No. of Intakes
400	260	9 or 10	12 x 12	2
800	530	9 or 10	12 x 12	3
1,200	800	12	15 x 15	5
1,800	1,200	12	15 x 15	7
2,700	1,800	14	18 x 18	11

Larger floor areas normally would use two or more fan units.
*Figures on basis of 2/3 of a cubic foot of air per minute for each square foot of floor area.

THE EFFECT OF COCCIDIA ON THE METABOLISM AND TEMPERATURE REGULATION OF CHICKENS

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Chickens infected with cecal coccidiosis usually show the first clinical symptoms late on the fourth or on the fifth day following infection. At this time the liver and muscle glycogen is lower and the blood sugar is usually much higher than normal. If a sugar solution is fed to these chickens, the blood sugar is increased but the glycogen stores are not increased as they are in uninfected chickens.

When uninfected chickens were subjected to cold their metabolic rate increased and they maintained their body temperature within about one degree. When infected chickens of like size and age were subjected to the same cold environment their metabolic rate decreased and the body temperature of the same chickens dropped as much as twenty degrees centigrade. This was true of Leghorn chickens weighing as much as 1200 grams. (Abstract—Poultry Science 29: 763, 1950.)

AVERAGE RESULTS, DIFFERENCES IN HATCHING RESULTS AND REDUCTION TO COMMON DENOMINATORS

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Frankfort A. Main, Germany

Three problems are considered: (1) How can one calculate the average production of a flock? (2) How should the several hatches be evaluated in respect of their results and their profits? (3) How are the progeny of varying ages but stemming from the same hen to be reduced to a denominator that will make it possible to compare them one with the other?

Pullets from one and the same origin hatched in February, March, April, and May, started laying on the average on their 163rd, 178th, 189th and 200th day of life respectively.

The author establishes a correct method for calculating the average laying maturity of the entire flock and points out that in comparing one must not only take into account differences in feeding but also the month the chickens were hatched, a factor which is often forgotten.

A comprehensive table shows the laying results of the four hatches mentioned above. Pullet, autumn, and winter egg production are shown. Thus the differing degrees of profit are proved. In all cases the author has based the average result per hen on a feeding period of 365 days. Each hen has first 180 days of immaturity, her first laying year commencing on the 181st day of her life, whereas the test year ends on the 30th of September.

Thus for instance the author calculates for a hen hatched on the 15th of February as follows: 180 days of immaturity (not included in the calculation) followed by 48 days up to the beginning of the first laying year on October 1 plus 365 days up to the 30th of September, giving a total of 413 feeding days. The hen hatched on 5 May will not be 180 days old by 1 October; therefore 31 days must be deducted from the 365 and this hen is therefore booked for 334 feeding days. Further examples are given including that of a hen hatched on May 5, 1949 that died on August 21, 1950. Here the period booked is from October 1 to August 21 i.e., 325 days less 31 days, as shown above, leaving a total feeding period of 298 days.

To facilitate rapid calculation a table is included from which the results can be read off.

At the end of the year the total number of feeding days is divided by 365, thus determining the number of hens per 365-day feeding period. The number of eggs divided by the number of hens gives us the production figure per 365 days and hen.

In this way it is also possible to calculate results for each hatch separately and to draw comparisons.

Assuming that a hen hatched on February 15, 1948 lays 180 eggs by October 30, 1949 she will be worth less than a hen hatched on May 5, 1948 and laying the same number in the same time (but for a lesser number of feeding-days). The author reduces the hens to a common denominator in order to reveal their actual breeding value on the basis of their egg production. The calculation is very similar to that given above.

For example:

Hen No.	Date hatched	No. of eggs from beginning up to 30 Sept.	Life in days (feeding days) calculated from 181st day of life) up to 30 Sept. (as per table)	Denominator per 365 feeding days
15	10 Feb.	181	418	158
29	26 Feb.	192	402	174
43	22 Mar.	161	378	155
69	9 May	149	330	165

The author fully realizes that this does not represent a pat solution but it appears to be the best hitherto offered.

(Durchschnittsergebnisse, Schlupunterschiede und Normierung. Der Gefluegelhof (Switzerland) Dec. 9, 1949. No. 49. p. 787-790).

THE STORAGEABILITY OF FARM WASHED EGGS

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Michigan State College, East Lansing, Mich.

Two cases of eggs from each of five farms and 2 cases of grade A large eggs from a grading station were oil treated and stored for 8 months. Half of the eggs from each farm were clean when laid. The other half, dirty or slightly so, were washed. Each farmer used a different washing technique.

Samples of eggs were removed from storage at 3, 6, and 7 months. The remaining eggs were removed at 8 months. Each egg of the samples was candled, broken and given a visual score. All eggs were tested for souring. Some eggs in each sample were weighed, their albumen heights measured, and Haugh units determined.

Souring occurred at 3 months in one lot of clean eggs and one lot of washed eggs. After 3 months storage souring was about 5 times as prevalent in washed eggs as in naturally clean eggs. Only one lot of naturally clean eggs was free from souring. All other lots of clean eggs or washed eggs had some souring. Most of the sour eggs were found in A and B grade eggs. Very few were detected by candling.

Candled quality was slightly higher in naturally clean eggs, but broken out quality measurements did not show any differences. (Abstract—Poultry Scinece 29: 755, 1950.)

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The World's Poultry Science Association has entered into an agreement with University Microfilms, Ann Arbor, Michigan, U.S.A. to make available the World's Poultry Science Journal in microfilm form.

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THE EFFECT OF CREEPING INDIGO (*INDIGOFERA ENDECAPHYLLA*) WHEN FED TO GROWING CHICKENS*

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Creeping indigo (*Indigofera endecaphylla* Jacq.) is a spreading or suberect perennial legume that has been studied for its agronomic desirability in Africa, Ceylon, Cuba, Hawaii, India, Java, Puerto Rico, and the Philippine Islands. Bogdan (1949) reported that this species was fed to steers and sheep for a few hours each day during a 16-day feeding trial and that it was palatable to them. Mundy (1932) and Fajardo (1934) reported, respectively, that mules and horses also ate this crop. Emmel and Ritchy (1941), however, have reported that New Zealand rabbits, when permitted to graze in a plot of *Indigofera endecaphylla*, died within a period of 6 to 15 days. The rear quarters of afflicted animals were paralyzed and respiration became feeble. No reference has been found regarding the effect of this legume on chickens.

Recent investigations by the Departments of Animal Husbandry and Agronomy of the University of Hawaii have indicated that this member of the legume family may have induced premature births of stillborn calves. With regard to poultry, there had been an unconfirmed field report that dehydrated creeping indigo, when substituted for 50 percent of a standard grower mash during a period of acute feed shortage, caused death of 12- to 13-week-old cockerels after 3 days on the feed. This study was undertaken to procure information on the effects of creeping indigo on growth and livability of chicks.

MATERIALS AND METHODS

For trials 1 and 2, terminal vine cuttings of creeping indigo were run through an ensilage cutter and dried in an electric oven at 100 C. Excess cuttings were stored on a wire screen so that the last of this sample was placed in the oven on the third day. The dried whole forage was then ground in a hammer mill and the coarser stems were separated by passing the milled material through a seed cleaner. In trial 3, leaves were hand stripped 12 to 18 inches from the terminal portions of the vines and dried at 100 C. The entire sample

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was processed at one time. The methods of drying the leaf meals for trial 4 are explained in Table I. With the exception of trial 2, the meals were substituted for alfalfa meal in a standard chick starter mash on a pound-for-pound basis. Since the birds were observed beyond 6 weeks of age in trial 1, the substitutions made in the starter rations were continued in the grower rations. The starter rations are given in Table I.

In this study, 565 straight-run day-old New Hampshire chicks were started in battery brooders. In all trials except trial 4, 40 chicks were placed at random on each ration 4 hours after they were removed from the hatcher. In trial 4 only 17 chicks were started on each of the experimental rations. Weekly body weight and feed consumption data were collected, and each chick was carefully observed at 14 and 28 days to determine if it was affected by its diet. The chicks that were continued on experiment beyond 6 weeks of age were vaccinated with fowl pox and formalin inactivated Newcastle disease vaccines and moved to wire-floor developer pens.

RESULTS

In trial 1 the males were reared to 14 weeks of age. At that time the controls (ration 1) averaged 1,795.8 grams, and those on rations 2, 3, and 4 weighed 1,880.5, 1,652.1, and 1,498.8 grams, respectively. The variation in growth rates obtained on the four rations was highly significant when tested by the analysis of variance. The females were reared to 28 weeks of age. As may be seen in Figure 1 the group fed ration 2 gained weight more rapidly than did the controls, whereas the group fed ration 4 was markedly retarded. At 28 weeks of age the pullets fed rations 1, 2, 3, and 4 averaged 2,291.0, 2,404.8, 2,297.6, and 2,079.0 grams, respectively. The F value between groups was also highly significant. The groups fed 1.25 percent creeping indigo meal grew faster than their respective controls, the groups fed 2.50 percent grew about as well, and those fed 5.0 percent were significantly retarded. The substitution of 5.0 percent creeping indigo meal for 5.0 percent alfalfa meal was detrimental to the chicks' rate of growth.

Livability was not adversely affected by the inclusion of creeping indigo meal up to 5.0 percent of total ration. There was no mortality to 6 weeks of age, and subsequent mortality of the males and females fed creeping indigo meal was not significantly greater than that of the controls.

The chicks in trial 2 were fed creeping indigo meal at concentrations of 10, 15, and 20 percent of total mash con-

TABLE I

Composition of Chick Starter Rations Utilized in Trials 1 to 4

Ingredients	Ration Numbers													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Ground yellow corn, lb.	27.0	27.0	27.0	27.0	—	—	—	27.0	27.0	27.0	27.0	27.0	27.0	27.0
Ground wheat, lb.	20.0	20.0	20.0	20.0	—	—	—	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Ground oats, lb.	10.0	10.0	10.0	10.0	—	—	—	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Fish meal, lb.	5.0	5.0	5.0	5.0	—	—	—	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Meatscrap, lb.	5.0	5.0	5.0	5.0	—	—	—	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Soybean oil meal, lb.	26.0	26.0	26.0	26.0	—	—	—	26.0	26.0	26.0	26.0	26.0	26.0	26.0
Alfalfa meal, lb.	5.0	3.75	2.5	—	—	—	—	3.75	2.5	—	—	—	—	—
Bone meal, lb.	0.5	0.5	0.5	0.5	—	—	—	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Ground oyster shell, lb.	1.0	1.0	1.0	1.0	—	—	—	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Salt, lb.	0.5	0.5	0.5	0.5	—	—	—	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Riboflavin, mg.	160.0	160.0	160.0	160.0	—	—	—	160.0	160.0	160.0	160.0	160.0	160.0	160.0
Manganese sulfate, gm.	7.5	7.5	7.5	7.5	—	—	—	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Desterol (Dry D), gm. (2,000 A.O.A.C./gm.)	10.0	10.0	10.0	10.0	—	—	—	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Control ration, lb.	—	—	—	—	90.0	85.0	80.0	—	—	—	—	—	—	—
Creeping indigo meal (100°C.), lb.	—	1.25	2.5	5.0	10.0	15.0	20.0	—	—	—	—	—	—	—
Creeping indigo leaf meal (100°C.), lb.	—	—	—	—	—	—	—	1.25	2.5	5.0	5.0	—	—	—
Creeping indigo leaf meal (70°C.), lb.	—	—	—	—	—	—	—	—	—	—	—	5.0	5.0*	5.0†
Trials	Control	1				2				3			4	

*Stripped leaves stored 3 days in sacks, then air-dried at room temperature (approximately 75.0°F.).
†Stripped leaves placed in drier and dehydrated under forced draft at room temperature.

sumption. At 4 weeks of age the variations among the average body weights attained on the four rations were highly significant. Straight-run chicks fed the control diet averaged 273.8 grams; the chicks fed ration 5 weighed 217.4; the chicks fed ration 6 averaged 183.0; and those fed ration 7 weighed 152.8 grams. Palatability was high despite the large amounts of creeping indigo meal. The chicks receiving 20 percent creeping indigo meal consumed 95 percent as much feed as their controls. Efficiency of feed utilization was affected, however, since the group receiving 20 percent creeping indigo meal required 96.5 percent more feed than did the controls to produce a gram of gain to 4 weeks of age. It should be realized, however, that rations 5, 6, and 7 were not as well balanced due to the large-scale supplementation of indigo meal.

The first sign of affliction induced by creeping indigo meal was observed at 14 days. By 21 days, affected chicks were frequently detected in the lots receiving 15 and 20 percent creeping indigo meal. A summary of the incidence of morbidity noted at 14 and 28 days may be seen in Table II. During the early stages of affliction the chicks exhibited the following syndrome: their heads were frequently retracted on their breasts or twisted onto their shoulders; some moved

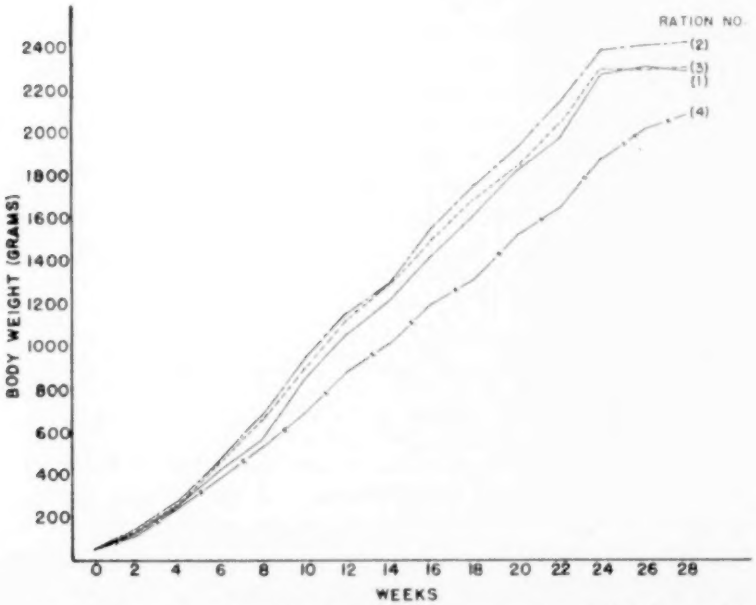

Fig. 1. Growth of females fed different levels of oven-dried creeping indigo meal.

TABLE II

Incidence of Morbidity Induced by Creeping Indigo

Ration	14 Days				28 Days			
	Normal	Slightly affected	Markedly affected	Dead	Normal	Slightly affected	Markedly affected	Dead
Trial 2								
1	40	0	0	0	40	0	0	0
5	40	0	0	0	39	0	1	0
6	39	1	0	0	29	4	7	0
7	40	0	0	0	24	4	12	0
Trial 4								
1	17	0	0	0	17	0	0	0
11	9	3	5	0	4	9	3	1
12	10	3	4	0	5	5	4	3
13	11	0	5	1	1	9	5	2
14	8	1	8	0	4	2	4	7

rapidly in the direction their heads were turned or sat on their hocks with drooping wings. As the syndrome became extreme the chicks were less active, and some were unable to drink. Feed was caked on beaks and tongues of several that lay on their sides. In many ways these chicks showed symptoms that coud be mistaken for Newcastle infection. Tests for hemagglutination-inhibition were negative, however, and no chicks died during this trial.

A third trial was undertaken to determine the effect of creeping indigo leaf meal. Rations 1, 8, 9, and 10 were compared in this study. During the 6-week study the controls gained 582.4 grams; the chicks on rations 8, 9, and 10 gained 595.2, 570.3, and 455.3 grams, respectively. These results were in good agreement with those of trial 1. The chicks fed 1.25 percent creeping indigo leaf meal were heavier than their controls; those fed 2.5 percent were approximately as heavy; and the chicks fed 5.0 percent were significantly lighter than the controls. No definite symptoms of toxicity were noted up to 28 days of age. However, at the termination of this study one chick fed ration 8 was slightly affected as was one chick fed ration 9, and three chicks fed ration 10 were seriously affected. As reported previously there were 40 chicks in each group. No chicks died during this study.

The results of trial 4 were much different from trials 1 and 3. The chicks fed creeping indigo leaf meal were significantly retarded in rate of growth at 4 weeks of age. As may be seen in Table III the controls averaged 348.0 grams. In contrast, the chicks fed rations 11, 12, 13, and 14 weighed, respectively, 45.2, 39.6, 61.6, and 40.4 percent as much as the controls. Furthermore, in this trial symptoms of toxicity were manifested at 7 days of age, and by 14 days there were

TABLE III

Effect of Different Methods of Drying Creeping Indigo Leaf Meal on Body Weight

Rations	Body Weight (grams)				
	Initial weight	First week	Second week	Third week	Fourth week
1	41.6	76.8	138.1	229.0	348.0
11	41.5	67.9	94.5	143.4	157.6
12	41.2	67.0	86.6	117.2	137.9
13	41.5	69.3	116.6	165.4	214.4
14	41.4	63.4	81.9	116.4	140.6

numerous chicks in each treatment containing the indigo leaf meal that were markedly affected. In no previous study, even when 15 and 20 percent creeping indigo meals were fed, had such an early onset of affliction been observed. Mortality ranged from 5.9 to 41.2 percent of the chicks started on creeping indigo.

It was possible to observe the effect of creeping indigo on the onset of egg production. The data shown in Table IV

TABLE IV

Effect of Different Levels of Creeping Indigo Meal on Egg Production

Rations	Weekly Hen-Day Egg Production						
	1st	2nd	3rd	4th	5th	6th	7th
1	0.0	0.0	14.2	23.2	47.9	59.2	62.2
2	1.7	6.7	13.4	22.7	35.3	52.7	52.7
3	0.0	0.0	6.1	27.5	38.4	46.9	48.0
4	0.0	0.0	0.0	2.5	6.7	16.0	38.6
Age of pullets (wks.)	22	23	24	25	26	27	28

Between rations $F = 8.907$ $P < 0.01$

were procured during trial 1. As may be seen, the pullets fed ration 2 matured earlier than their controls; the pullets fed ration 3 matured at about the same time; those fed ration 4 were retarded. At the end of 7 weeks of egg production the differences between rations were highly significant. Creeping indigo meal, when fed at 5 percent of the diet, was deleterious to onset and rate of egg production as well as to growth.

DISCUSSION

Creeping indigo (*Indigofera endecaphylla*) is a legume that is well adapted to Hawaiian conditions. Despite its agronomic desirability, however, the results of this study argue against its inclusion as a poultry feed if fed beyond 2.5 percent of the chick's diet. It has been found to depress

growth when fed at concentrations of 5.0 percent or more of the chick's ration, and certain samples, when fed in lesser amounts for 6 weeks, have caused toxic reactions. This species of *Indigofera* appears to vary considerably in its content of some toxic principle. Evidence for this may be had by comparing the results of trials 3 and 4. Even though rations 10 and 11 were the same, the chicks fed ration 10 weighed 83.3 percent whereas the chicks fed ration 11 weighed 39.6 percent of their respective controls. Furthermore, no chicks died when fed ration 10 while 17.6 percent died when fed ration 11. It is probable, also, that the leaf meal is more toxic than creeping indigo meal. The difference in growth obtained on rations 4 and 11 is suggestive; no direct comparison was made, however, to clarify this point. Possibly, unrecognized varietal strains, rate of growth of the plant, season, and the chemical content of the soil influenced the concentration of the toxic principle in the creeping indigo meals utilized in this investigation.

It was not possible to procure a pathological description of this malady. Chicks showing typical symptoms of affliction were submitted to Dr. E. H. Willers of the Territorial Board of Agriculture and Forestry, Honolulu, and he was unable to detect any diagnostic lesions. Hemagglutination-inhibition tests were made on the blood of the chicks to determine whether Newcastle disease was involved, so closely did the syndrome of creeping indigo toxicity resemble that disease, and these tests were also negative. The reaction was not lasting once the chicks were returned to the control ration. Within 3 weeks many of the chicks that were markedly affected were reclassified as normal or slightly affected.

Studies on the biochemical fractionation of this species should be undertaken. It may be of fundamental significance to determine the compound that has induced the toxic response in the experimental chicks. Furthermore, these data suggest the presence of a growth-promoting substance for, when 1.25 percent of creeping indigo meal or leaf meal was fed, the rate of growth was greater than that of the controls. This phenomenon was observed in trials 1 and 3. Perhaps this reaction is comparable to that of other toxic principles which promote appetite and growth when given traces, but are poisonous when fed in larger amounts. From the results of this study it may be concluded that creeping indigo meal or leaf meal should be fed with caution and that it is not desirable to use it at levels higher than 1.25 to 2.50 percent of a chick's ration.

SUMMARY

Creeping indigo meals and leaf meals were fed to New Hampshire chicks in four successive trials. A slight stimulation in growth rate was observed when 1.25 percent of these meals was incorporated in a chick starter ration as a substitute for alfalfa meal. No real difference in growth rate was observed when 2.5 percent was used; however, when 5, 10, 15, and 20 percent were substituted, the growth rate was significantly impaired in proportion with the amount fed.

Creeping indigo contains a compound which is toxic to poultry and which appears to vary in concentration among samples. A toxic response that physically resembled Newcastle disease during its early manifestations was induced after only 7 days (trial 4) on the indigo rations. Recovery of afflicted birds to what appeared to be normalcy was obtained within 3 weeks after they were returned to the control ration. Mortalities ranging from 5.9 to 41.2 percent were obtained in one trial when creeping indigo leaf meal, processed in different ways, was fed to day-old chicks for 28 days at the rate of 5 percent. Whereas 1.25 and 2.50 percent creeping indigo meal did not adversely affect age to sexual maturity, 5 percent significantly retarded development.

ACKNOWLEDGMENT

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*BASIC RULES GOVERNING EGG LAYING TESTS THROUGHOUT THE WORLD

July 1, 1950

Name of Test	Duration of Test	Birds per Entry	Basis of Scoring
Australia			
Burnley Egg-Laying Competition, Melbourne, Victoria	48 weeks	2 pullets	Only first grade eggs credited; first two months 1¼ oz. or more per egg; third and later months 2 oz. or more per egg.
Hawkesbury Agricultural College Egg-Laying Competition, Richmond, New South Wales	50 weeks	6 pullets	Only first grade eggs credited; first month 1½ oz. or more per egg; second and later months 1¾ oz. or more per egg.
Parafield Official Egg Laying Competition, Adelaide, South Australia	365 days	Singles, trios, or teams of 6 pullets	Only first grade eggs credited; first two months 1¼ oz. or more per egg; third month 1⅞ oz. or more per egg; fourth and later months 2 oz. or more per egg.
State Egg-Laying Competitions, New Town, Tasmania	50 weeks	Singles, trios, or teams of 6 pullets	Only first grade eggs credited; first month 21 oz. or more per dozen; second month 22 oz. or more per dozen; third month 23 oz. or more per dozen; fourth and later months 24 oz. or more per dozen.
Muresk Egg Laying Trial, Perth, West Australia	48 weeks	Teams of 6 pullets	Only first grade eggs credited; first two months 1¼ oz. per egg; third and later months 2 oz. or more per egg.
Belgium			
Concours de Ponte National, Roulers	48 weeks	7 pullets, 5 best to count	Only first grade eggs credited; first 4-week period 52 grams or more per egg; second 4-week period 53 grams or more per egg; third and later periods 54 grams per egg.
Cuba			
Concurso Nacional de Puesta, Santiago de las Vegas, Havana	51 weeks	13 pullets	Standard U.S.A. point system
Denmark			
Kontrolstationen for Hons, Favrholm	365 days	10 Pedigreed pullets from one male	Color and form of eggs typical and normal for breed; all eggs weighed; average weight for year to exceed 57 grams per egg.

England			
East Lancashire Laying Test, Tockholes, Darwen, Lancashire	48 weeks	6 pullets	Only first grade eggs credited; first 8 weeks 1¼ oz. or more per egg; after 8 weeks 2 oz. or more per egg.
National Laying Test, Milford, Godalming, Surrey	48 weeks for pullets; 52 for hens	Singles; pens of 6 and 12 pullets; 10 hens	Only first grade eggs credited; first 8 weeks 1¼ oz. or more per egg; after 8 weeks 2 oz. or more per egg.
National Commercial Test, Milford, Godalming, Surrey	72 weeks	20 pullets from entry of 50 pullet chicks reared at test	Judged on gross receipts from sale of cull pullets, eggs and hens left at end of test.
Yorkshire Federation Egg-Laying Test, Otley, Yorkshire	48 weeks	Singles; pens of 4, best 3 to count; pens of 7, best 5 to count; pens of 12, best 10 to count	Only first grade eggs credited; first 8 weeks 1¼ oz. or more per egg; after 8 weeks 2 oz. or more per egg.
British Oil & Cake Mills Hen Battery Laying Trials, Stoke Mandeville, Buckinghamshire	48 weeks	Teams of 6 pullets	Profits from sale of eggs and birds at close of trial, with feed cost deducted.
Ireland			
National Egg-Laying Test, Munster Institute, Cork	46 weeks	6 pullets	Point system—eggs qualifying for points First 8 weeks—1-15/16 oz. or more per egg; after 8 weeks—2 oz. or more per egg. Point value for each qualifying egg: First 12 weeks—3 points Next 24 weeks—2 points Last 10 weeks—3 points
Northern Ireland			
Northern Ireland Egg Laying Test, Stormont	48 weeks	6 pullets	Only first grade eggs credited; first 8 weeks 10 eggs may be 1¼ oz. or more per egg, all others 2 oz. or more per egg; after 8 weeks 2 oz. or more per egg.
Northern Ireland Progeny Test, Stormont	48 weeks	12 pullets, reared at home farm, from one sire and minimum of 6 hens	Only first grade eggs credited; first 8 weeks 10 eggs may be 1¼ oz. or more per egg, all others 2 oz. or more per egg; after 8 weeks 2 oz. or more per egg.

*BASIC RULES GOVERNING EGG LAYING TESTS THROUGHOUT THE WORLD (Continued)

July 1, 1950

Northern Ireland (Cont.)			
Northern Ireland Cockerel Test, Stormont	48 weeks	12 pullets reared at test, sired by one male mated to selected hens (number not stated)	Only first grade eggs credited; first 8 weeks 10 eggs may be 1¾ oz. or more per egg, all others 2 oz. or more per egg; after 8 weeks 2 oz. or more per egg.
Scotland			
Scottish Hen Battery Laying Trials, South Cathkin, Rutherglen	48 weeks	6 pullets	Profits from sale of eggs and birds at close of trial, with feed cost deducted.
Spain			
Concurso Avicola de Puesta, Barcelona	48 weeks	10 pullets, best 7 to count	Only first grade eggs credited; first 4-week period all eggs weighing 50 grams or more; second and later periods all eggs weighing 56 grams or more each.
Sweden			
Sveriges Fjaderfaavelsforenings Varpkontroll, Malmo	11 months	10 pullets pedigreed from a mating of one male and not less than 4 females (reared by owner)	Each bird judged according to following scale of points: Total weight of eggs produced—max. 40 pts. Body size " 10 " Body type " 15 " Feathering " 5 " Average egg weight " 15 " Shell quality " 5 " Shell form " 5 " Shell color " 5 " Total 100 "
Sveriges Fjaderfaavelsforenings Varpkontroll, Nykvarn	11 months	Same as above	Same as above

Union of South Africa			
Central Egg-Laying Competition, Glen, Orange Free State	48 weeks	5 pullets, best 4 to count	Only first grade eggs credited; first 4 weeks 1⅞ oz. or more per egg; after 4 weeks 2 oz. or more per egg.
Western Province Egg Laying Competition, Tokai, Cape Province	48 weeks	5 pullets, best 4 to count	Only first grade eggs credited; first 4 weeks 1⅞ oz. or more per egg; after 4 weeks 2 oz. or more per egg.
Johannesburg Egg-Laying Competition, Johannesburg, Transvaal	48 weeks	5 pullets, best 4 to count	Only first grade eggs credited; first 4 weeks 1⅞ oz. or more per egg; after 4 weeks 2 oz. or more per egg.
Durban and Coast Poultry Club Test, Durban, Natal	48 weeks	5 pullets, best 4 to count	Only first grade eggs credited; first 4 weeks 1⅞ oz. or more per egg; after 4 weeks 2 oz. or more per egg.
United States of America			
Standard Tests:			
Arizona Egg Laying Test, Tucson, Arizona	51 weeks	13 pullets	Standard U.S.A. point system. Eggs weighing 26 oz. or more per doz.—1.10 pts. Eggs weighing 25 oz. per doz. 1.05 pts. Eggs weighing 24 oz. per doz. 1.00 pts. Eggs weighing 23 oz. per doz. .95 pts. Eggs weighing 22 oz. per doz. .90 pts. Eggs weighing 21 oz. per doz. .85 pts. Eggs weighing 20 oz. per doz. .80 pts. Eggs weighing 19 oz. per doz. .75 pts. Eggs weighing 18 oz. per doz. .70 pts.
California Egg Laying Test, Modesto, California	51 weeks	13 pullets	U.S.A. point system
Florida Egg Laying Test, Chipley, Florida	51 weeks	13 pullets	U.S.A. point system
Georgia Egg Laying Test, Athens, Georgia	51 weeks	13 pullets	U.S.A. point system
Hunterdon County Egg Laying Test, Flemington, New Jersey	51 weeks	13 pullets	U.S.A. point system
Illinois Egg Laying Test, Quincy, Illinois.	51 weeks	13 pullets	U.S.A. point system
Maine Egg Laying Test, Monmouth, Maine	51 weeks	13 pullets	U.S.A. point system

*BASIC RULES GOVERNING EGG LAYING TESTS THROUGHOUT THE WORLD (Continued)

July 1, 1950

United States of America (Cont.)			
Missouri Egg Laying Test, Mountain Grove, Missouri	51 weeks	13 pullets	U.S.A. point system
New York State Egg Laying Test, Farmingdale, New York	51 weeks	13 pullets	U.S.A. point system
Oklahoma Egg Laying Test, Stillwater, Oklahoma	51 weeks	13 pullets	U.S.A. point system
Pennsylvania Egg Laying Test, Harrisburg, Pennsylvania	51 weeks	13 pullets	U.S.A. point system
Rhode Island Egg Laying Test, Kingston, Rhode Island	51 weeks	13 pullets	U.S.A. point system
Storrs Egg Laying Test, Storrs, Connecticut	51 weeks	13 pullets	U.S.A. point system
Tarleton Egg Laying Test, Stephenville, Texas	51 weeks	13 pullets	U.S.A. point system
Western New York Egg Laying Test, Stafford, New York	51 weeks		U.S.A. point system
Non-Standard Tests in U.S.A.			
California Official Random Sample Egg Laying Test, Modesto, California	18 months	100 unsexed chicks selected at random from owner's flock, reared at test	Cockerels sold at 12 weeks and value credited to entry; returns from sale of cockerels at 12 weeks, sale of eggs by market grade, and sale of hens at close of test, with feed cost and original price of chicks deducted.
California Official Random Sample Poultry Meat Production Test, Modesto, California	11 weeks	100 unsexed chicks selected at random from owner's flocks, reared at test	Average cockerel and average pullet income over chick and feed costs, based on number of each sex in original entry.

Georgia National Broiler Breeding and Testing Project, Athens, Georgia	51 weeks	26 pullets and 3 cockerels, from which 3 groups of chicks are reared at test	Data published, but pens not ranked, showing egg production, egg size in oz. per dozen, percentage fertility and percentage hatch of total eggs, feathering of chicks, body weight at 11 weeks, mortality of chicks to 11 weeks.
Maine Production and Broiler Test, Monmouth, Maine	51 weeks	26 pullets and 3 cockerels, from which 3 groups of chicks are reared at test each year	Data published but pens not ranked, showing egg production, point score, percent fertility, percent hatch of total eggs, feathering of chicks at 4th and 10th weeks, body weights at 10th and 14th weeks, and comb height, pigmentation, mortality and dressing grades at 14th week.
New Jersey Flock Mating Test, Vineland, New Jersey	51 weeks	16 pullets from original sample of 30 sexed pullet chicks reared by owner	Returns from sales of eggs and value of birds remaining at end of test, with feed cost deducted.
New York Official Random Sample Poultry Test, Horseheads, New York	500 days	50 pullet chicks reared at test	Returns from sale of eggs and value of birds remaining at end of test, with feed cost and original price of chicks deducted.
Vineland Hen Test, Vineland, New Jersey	52 weeks	13 hens	U.S.A. point system

* Assembled by World's Poultry Science Association Committee on Egg Laying Tests: C. S. Platt, Rutgers University, New Brunswick, N.J. (chairman); R. R. Hannas, Editor, American Poultry Journal, 536 South Clark St., Chicago, Ill.; R. J. G. Jaap, Poultry Department, Ohio State University, Columbus, Ohio; R. M. Hanson, Box 85, R #1, Corvallis, Oregon; G. R. H. Nugent, Blacknest Poultry Farm, Dunsford, England; Miss E. E. Kidd, 24a, Black Lion Lane, Hammersmith, London, W. 6, England; D. Philpott, Department of Agriculture, Upper Merrion St., Dublin, Eire; Miss Laura Kaufman, Institute for Agricultural Research, Pulawy, Poland; George Hibbert, Athlone Farm, P.O. Box 41, Berglvei, Transvaal, South Africa; F. C. Lievens, rue de la Stationa 26, Opwijck, Belgium; W. A. Kock, Lykkevej 9, Charlottenlund, Denmark; H. Engler, Schweiz Geflugelzucktschule, Zollikofen, Bern, Switzerland; K. Bilgemre, Animal Breeding Institute of Agriculture, College in Ankara, Ankara, Turkey; C. F. Anderson, Department of Agriculture, Box 901E, G.P.O., Adelaide, Australia; Alex Wiltzer, 28 rue Bonaparte, Paris 6, France; J. G. Tukker, 298 Utrechtsweg, DeBilt, Holland; David Uri, Agricultural Research Station, Rehoboth, Israel; A. M. Gericke, Department of Agriculture, Union Buildings, Pretoria, South Africa.

POULTRY HUSBANDRY IN INDONESIA

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The diet of the people in Indonesia contains in general very few proteins of animal origin. Milk is almost not used and according to Merkens (1949) only 4 kg. meat, per head, per year, is consumed. Besides this only small quantities of fish and eggs are eaten. In connection with this frugal diet poultry husbandry is of great importance by the production of meat and eggs.

Only chickens and ducks are of economical importance. Precise numbers about the poultry population are not known, but it is supposed that Indonesia has about 60 million hens and cocks and 50 million ducks.

CHICKENS

In the field of poultry husbandry the poultry farms have to be distinguished from the poultry husbandry of the natives.

On the farms, mostly the property of foreigners, modern utility breeds are kept. The eggs are sold to private people, hotels, and airlines. Big poultry farms don't exist. Since before the war, a good Newcastle vaccine did not exist and it was practically impossible to protect the farms against this disease. The breeds generally kept on the farms are the Rhode Island Red, Australorp, and White Leghorn. Of these breeds the Reds and Australorps are favourites.

Poultry keeping is limited mostly to small flocks. It may be expected however, that with the availability of a good vaccine against Newcastle disease and greater possibilities for importing breeding stock, poultry keeping will develop rapidly. And this will be of the greatest importance to the poultry husbandry of the natives, because superior breeding stock will become available.

The poultry husbandry of the natives is of great economical importance. Almost every Indonesian family, at least in the country, keeps poultry. The animals are not kept in enclosures, but in the daytime they are at liberty in the vicinity of the houses and at night they sleep in sheds and trees.

The principal component of the diet is the rice bran, which comes free when pounding the rice. Besides this, the residue of the coconut, left over from the preparation of coconut-oil and coconut-milk, is eaten. Furthermore, the leavings

of the family meal, some corn, rice, and everything which the village and neighbourhood yields in green fodder, insects and worms, are consumed.

It is the task of the women to take care of poultry. The husbands are only interested in good fighting cocks.

The average production of a native hen is no more than 80 eggs a year, with an average egg weight of about 40 gr. The weight of cocks and hens is about 2.3 kg. and 1.6 kg., respectively.

Hatching is always practiced in the natural way.

The hens which are kept can't be distinguished in different pure breeds. There are however regional differences, for instance between the Bantam and the Sumatra variety. Breeding during several generations shows, however, that pure native breeds don't exist. Everywhere pell-mell crossing has been practiced, not only with Indonesian breeds but also with a lot of European and Asiatic breeds.

It is supposed that all the Indonesian breeds were domesticated from the Gallus gallus gallus. Later on crossing with the Gallus gallus bankiva was practised. The Gallus varius did not play a part in the development of the Indonesian breeds.

The purest Indonesian breed is the "Kedu," the Black Java, which is found in the Kedu district on Java. Besides the black variety, there are also white, black and white, red, and brown varieties.

Merkens and Mohede (1941) showed before the war that the Black Java can be developed to a good utility breed for the village. In the summary of their article they mention the following data.

The average body weight of the chicks at the age of two days was 30.63 gr; that of the cocks and hens, when three months old, respectively, 914.9 and 836.7 gr. and at 6 months respectively, 2379.6 and 1671.5 gr. At 12 months, the breeding males showed an average weight of 2640 gr. and the hens of 1791 gr. The heaviest older cocks weighed more than 3 kg. and the heaviest hens nearly 3 kg.

Egg laying started at an average age of 188 days. In the first year (6-18 months) 123.9 eggs were produced, with an average weight of 49.9 gr. Some hens produced more than 180 eggs a year, with an egg weight of more than 50 gr.

On the average the hens were broody over 3 times a year, each broody period lasting about 5 days. Though originating from black animals, among 462 of the descendants

375 black, 35 grey, 20 brown, and 32 white animals were noted. Among the animals different types were met with. The shape of the combs varied considerably, although chiefly single, rose and walnut combs were found. The variety in the shape of the wattles was also considerable and some hens had no wattles at all.

Of the diseases of poultry in Indonesia, the most important is Newcastle disease. Almost every year it occurs and very severe losses are the result. A large scale vaccination campaign is just started. Other diseases are: fowl cholera (seldom), blackhead (seldom), tuberculosis (seldom), fowlpox, coryza, several diseases caused by fungi, and external and internal parasites. Fowlpest has not yet been established, no more than pullorum disease. After the war, also several cases of neurolymphomatosis (the avian leukosis complex) were found.

DUCKS

Besides small numbers for household purposes, ducks are also kept on a large scale in several districts of Indonesia. Two ways of keeping have to be distinguished. Firstly an extensive method, by which the ducks are kept at liberty on just harvested rice fields. They have to gather their own food, such as grass, worms and snails. When a particular ricefield has to be cultivated, the ducks are driven to other districts. In this way a herdsman and his flock travel over vast regions.

Some Chinese keep their ducks in a more intensive way. For instance, at the Eastcoast of Sumatra, where the animals are kept in enclosures the whole year round. Their food of animal origin is given in the form of the waste of the fish and shrimp industry.

Exact data about the productivity of the ducks in Indonesia are not known. In the case of the native ducks, it is generally accepted that they start laying at an age of 7 months and that their production during the favourable months of the year (3-4) is about 20 eggs a month. At an age of about 2½ years, the animals are slaughtered. On the Chinese duck farms the production per animal is about 150 eggs a year.

Besides a small number of Khaki Campbell ducks, which are kept on poultry farms, in general the Runner Duck is kept. In different regions different varieties are found. In general the ideal of the native duck keeper is about the same as that of his colleague in Western countries. Of the colour varieties mostly the fawn and ashen birds are kept.

At the Institute for Poultry Husbandry in Bogor, Gerhardt (1932) has shown, that among the Indonesian Runner Ducks some birds of high productivity are found. The following data were reported by Gerhardt (1932).

Of 8 fawn and ash-grey coloured ducks, which started laying at an average age of 155.5 days, only two produced less than 200 eggs in their first laying year. The other six laid from 257 to 290 eggs with an average weight of 55.6 to 63.8 gr.

It should be noted that these birds did not represent a result of a rigid long selection.

Since the Indian Runner ducks seldom are broody, the eggs are mostly hatched with "entoks" (Manila ducks). Eggs are also hatched in baskets with rice-bran, covered by cloth.

Of the duck diseases in Indonesia, in the first place the paratyphoid infections must be mentioned. Kraneveld and Co-workers (1940, 1947) isolated Salmonella typhimurium from 8 out of 300 investigated fresh eggs. Further, Newcastle disease is established, likewise pasteurella infections, tuberculosis, and blackhead. The ducks in Indonesia are also besieged by several external and internal parasites.

CONCLUSION

In this survey, it is shown that in the way of poultry improvement in Indonesia not much has been attained. The most important drawback always has been and still is that the circumstances of feeding and management are not sufficient for superior stock. A second reason has been that till now, on account of shortness in skilled workers and institutions, almost no research work could be done. Two animal husbandry institutes have been built in Bogor, one in connection with the Veterinary Faculty of the University of Indonesia and one connected with the Department for Economic Affairs. A bottleneck yet remains, consisting of a shortage of scientific workers.

LITERATURE

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REVIEW OF POULTRY PUBLICATIONS

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GENETICS

ASMUNDSON, V. S. TURKEYS; SELECTIVE BREEDING FOR CONTROL OF HERITABLE CHARACTERISTICS. *California Agriculture, 4:* 12. January, 1950.—Plumage color does not have much influence on the market value of turkeys. There is no discrimination against any particular plumage color. Most turkey breeds would consider the occurrence of a few off-color poults in the flock as of only minor importance.

If off-color poults occur among the progeny from pedigree matings, however, they will be of considerable economic importance to the particular breeder because they cannot be sold or used in his breeding program. If they occur in large numbers, they may very well ruin his reputation as a breeder of—for instance—Bronze turkeys. Consequently off-color poults may cause the breeder a loss of thousands of dollars.

Most off-color poults can be eliminated from a flock by using the known principles of genetics and the available information about inheritance.

The inheritance of pendulous crops was investigated at Davis by taking birds with pendulous crops, operating on them and removing the crop, or most of it. These birds were later mated, and it was found that the matings produced progeny of which 50% to 100% had pendulous crops. (Experiment Station Record)

DUZGUNES, ORHAN. *(U. California, Berkeley.)* THE EFFECT OF INBREEDING ON REPRODUCTIVE FITNESS OF S. C. W. LEGHORNS. *Poultry Sci. 29:* 227-235. 1950.—Different inbred lines selected for properties not directly connected with reproductive fitness behave in a variable fashion so far as reduction in fitness is concerned. In general, inbreeding tends to reduce the number of offspring of a mating surviving until breeding age. This reduction is mediated largely through decreases in hatchability (uniform in all lines studied) though other stages may be also affected. The elimination of offspring appears to operate at least to some extent in a selective manner, so that the relatively more homozygous individuals are represented in the population at breeding age to a lesser extent than the more heterozygous ones.—*Auth. abst.* (Biological Abstracts)

HAYS, F. A. *(U. Massachusetts, Amherst.)* IS FERTILITY IN DOMESTIC FOWL REGULATED BY INHERITANCE? *Poultry Sci. 29:* 171-175. 1950.—A study on the inheritance phases of fertility was made covering a 10-yr. period in a closed flock of R. I. Reds bred for high fecundity. The data include 82 males mated to 130 pullet dams to produce 291 daughters that were tested for fertility and 105 yearling dams that gave 227 daughters that were tested for fertility. Incompatibility appeared to be of no great importance in these matings but was more frequent in the daughters of yearling dams than in the daughters of pullet dams. Fertility records of mothers were of no value

for predicting the probable fertility of their daughters. There was absolutely no evidence that different degrees of fertility in mothers were transmitted to their daughters. In the group of 82 males studied there was evidence of sex-linked genes affecting fertility being transmitted from sire to daughter. The frequency distribution of the males when grouped according to the fertility records of their mates was statistically the same as when the males were grouped by the mean fertility of their daughters. One group of six males classed as low in fertility on the basis of their daughters' records gave daughters with low fertility when mated to females with very superior records. A group of 23 males classed as high in fertility consistently produced high fertility daughters from different types of dams and the means from different types of dams were essentially the same. In general, the data indicate that sex-linked genes may be operating to regulate fertility. Incompatibility and very early embryonic deaths do not appear to be prominent in the matings considered in this report.—*F. A. Hays.* (Biological Abstracts)

HAYS, F. A. *(U. Massachusetts, Amherst.)* THE VALUE OF ANNUAL EGG RECORDS IN BREEDING POULTRY FOR HIGH FECUNDITY. *Poultry Sci. 29:* 190-192. 1950.—Data on a closed flock of R. I. Reds bred for high fecundity through nine generations further substantiate the view that gross egg records furnish an unsatisfactory criterion of ability to transmit high fecundity. Such a result would be anticipated because the findings in many studies indicate that the number of eggs laid depends upon a complex of inherited characters as well as upon environmental and disease factors. It appears more logical, therefore, to select breeders on the basis of inherited physiological characters that are known to affect fecundity and to keep all environmental factors as uniform as possible. This study seems to justify the following deductions: Superior sires cannot be discovered through selection based on the mean egg production of their full sisters; some progress can be made through the selection of dams on the basis of their full sisters' mean records; and the mean 1st yr. record of dams has very low value in selecting to improve fecundity.—F. A. Hays. (Biological Abstracts)

HAYS, F. A. *(U. Massachusetts, Amherst.)* FURTHER STUDIES ON VIABILITY IN RHODE ISLAND REDS. *Poultry Sci. 29:* 193-194. 1950.—A study covering 9 generations of R. I. Reds bred for high fecundity including 327 families was concerned with the problem of viability. Since females with the highest degree of fertility appear to belong to families of low viability, it seemed desirable to discover if females with high fertility are likely to produce offspring with low viability. It was also desirable to learn if size of family at hatching is a criterion of viability of family. The data available failed to show that high fertility in dams was associated with low viability in their offspring and there was no evidence that initial size of family was a criterion of viability. —*F. A. Hays.* (Biological Abstracts)

HILL, A. T., and E. A. LLOYD. *(U. British Columbia, Vancouver.)* AUTO-SEXING REDBARS. *Poultry Sci. 29:* 3-9. 1950.—The study on the color pattern of Redbar chicks was undertaken to ascertain if the male and female chicks could be distinguished and if so, to devise a system of auto-sexing them. During the 1946 season, 1080 chicks from 36 female and 4 male parents were handled. 17 characteristics were described on each parental bird and 41 on each chick. Down color differences were found and the auto-sexing accuracy was improved from 62% to 94% with an avg. of 80% for the whole season. During the 1947 season, 542 chicks from 38 female and 6 male parents and 345 non-pedigreed pure Redbar chicks were handled. 22 characteristics were described on each parental bird and eleven on each chick. Auto-sexing accuracy varied from 91.4% to 98.5% with 93.6% for the whole season. Characteristics of the heads and bodies of the chicks used in the form of a key to obtain these accuracies were as follows: Females—uniform brown color, brown head stripes, brown back stripes; males—mottled heads and backs, white

head spots, very light heads and backs, short T or I shaped brown head stripes, 2 whitish back stripes.—*Authors.* (Biological Abstracts).

IYER, S. G. *(Indian Vet. Res. Inst., Izatnagar, U. P.)* IMPROVED INDIGENOUS HEN EVOLVED BY SELECTIVE BREEDING. *Indian Vet. Jour. 26:* 80-86. 1949.—Compared with White Leghorns and R. I. Reds, satisfactory characteristics were developed in indigenous (Desi) type fowl. Records were collected on fertility, hatchability, growth rate, food consumption, mortality, and date of sexual maturity.—*W. B. Darrell.* (Biological Abstracts)

LERNER, I. MICHAEL. *(U. California, Berkeley.)* EGG PRODUCTION: APPLICATION OF PRINCIPLES OF GENETICS MAY HASTEN IMPROVEMENT OF POULTRY. *California Agric. 3(8):* 6, 12. 1949.—Fundamental studies on population genetics in poultry indicate that combined family and individual selection is a faster and more economical method of improving egg production than is progeny testing. The process is shortened still more at considerable economy by taking trapnest records only until Jan. 1.—*G. W. Bohn.* (Biological Abstracts)

LERNER, I. MICHAEL, DOROTHY CRUDEN, and LEWIS W. TAYLOR. *(U. California, Berkeley).* THE RELATIVE BREEDING WORTH OF FULL SISTERS. *Poultry Sci. 28:* 903-913. 1949.—The theoretical basis of assessing the relative worth of individual records and of family averages was subjected to an exptl. test. Close agreement between observation and expectation on the basis of the genetic theory was obtained for the annual avg. egg production of birds surviving the 1st laying yr. as well as of all birds housed at 5 mos. of age. Reasonably close agreement was also obtained for the production of surviving birds from the beginning of lay to Dec. 31 of their 1st laying yr., and for sexual maturity. The other traits investigated (production of all birds to Dec. 31, and the avg. wt. of the first 10 eggs laid) could not be subjected to a direct comparison between observation and expectation, but apparently fall into the same pattern of behavior. The significant conclusions to be derived from this analysis refer to the validation of the formulas (derived by Lush on the basis of Wright's deductive analysis of genetic relationships) to be used in the assessment of the breeding value of individuals from their own records and from the avg. performance of the family of sisters to which they belong. The relative amt. of attention to be paid to these 2 criteria in the course of selection is a function of the degree of heritability and of family size. Tables are presented from which the weighting of family averages for the common range of heritabilities and family sizes in poultry breeding may be obtained. The related problem of selection on the basis of family averages alone vs. exclusively individual selection is also considered, and a table presented for determining the relative merit of the 2 systems of selection. Thus with respect to the avg. hen-housed egg production, family selection is found to be more effective than individual selection, while the reverse is true for traits with a high heritability, such as egg wt.—*Auth. summ.* (Biological Abstracts)

OAKBERG, EUGENE, and ALFRED M. LUCAS. *(Region. Poultry Res. Lab., East Lansing, Mich.)* VARIATIONS IN BODY WEIGHT AND ORGAN: BODY-WEIGHT RATIOS OF INBRED LINES OF WHITE LEGHORN CHICKENS IN RELATION TO MORTALITY, ESPECIALLY FROM LYMPHOMATOSIS. *Growth 13:* 319-337. 1949.—Body, liver, pancreas, and spleen wts. were taken for 380 normal 600-day-old hens representing 13 inbred lines. Comparison of organ wts. and organ:body-wt. ratios indicated that genetically detd. growth factors could be divided into those which affect the organism as a whole, those which are specific for liver and pancreas, and those which are specific for the spleen. Variations in incidence of deaths from lymphomatosis and from "other causes" was great between lines, and in some cases between families within lines. In 8 lines a correlation of incidence of

lymphomatosis mortality and "other deaths" was demonstrated; in 3 lines this relationship was not observed. Positive correlations of incidence of mortality from lymphomatosis with liver: and pancreas: body-wt. ratios were interpreted as due to common factors which result both in large pancreas and liver and in susceptibility to lymphomatosis.—*Authors.* (Biological Abstracts)

PEASE, M. S. *(Res. Sta., Cambridge, Eng.)* AUTO-SEXING BREEDS OF POULTRY. *Heredity 3: 377. 1949.—An abstract.* (Biological Abstracts)

WARREN, DON C. *(U. S. Dept. Agric., Lafayette, Ind.)* TECHNIQUES OF HYBRIDIZATION OF POULTRY. *Poultry Sci. 29:* 59-63. 1950.—There are many factors which make the problem of developing hybrid poultry differ somewhat from that in corn. The rate of development of highly inbreed lines is much lower in poultry and more costly. Sex-linkage also complicates the procedures with poultry. Strains of poultry may differ widely from vars. of corn with respect to the degree of homozygosity attained by conventional breeding methods. In the past too little attention has been paid to the quality of the stocks from which inbred lines of poultry have been produced. An effort should be made to determine whether combinability of stocks before they are inbred has any prediction value regarding combinability after inbreeding. Both intense inbreeding with but little selection pressure, and mild inbreeding with high selection pressure, have been practiced. The former has the merit of attaining a desired degree of inbreeding promptly but may result in high mortality of lines. The latter may give more productive lines but they may be too few to permit finding satisfactory combinations. One of the major needs in the poultry breeding program is an early evaluation with some rapidly breeding animal of the newer techniques now being considered by corn breeders.—*D. C. Warren.* (Biological Abstracts)

INHERITANCE OF EGG SIZE IS COMPLEX. PROGRESS IN SOLVING FARM PROBLEMS OF ILLINOIS. *Report* for 1947-48. page 65.—Crosses were made between two inbred lines of White Leghorn chickens producing eggs weighing about 46 grams and two other lines with an egg size of about 60 grams. The average egg size for daughters in four reciprocal crosses was 50.5,, 52.3, 53.3, and 53.9 grams, indicating rather clearly that neither large nor small egg size is dominant. (Experiment Station Record)

PHYSIOLOGY

ASMUNDSON, V. S., and BEN D. MOSES. *(U. California, Davis.)* INFLUENCE OF LENGTH OF DAY ON REPRODUCTION IN TURKEY HENS. *Poultry Sci. 29:* 34-41. 1950.—Six pens each with 10 approx. 32-week-old Bronze turkey hens of comparable breeding were placed on expt. Dec. 1 in 1945, 1946, and 1947. Bright lights (over 2 ft.-candles) were used. As compared with unlighted controls, 9 hours of daylight retarded the onset of egg production but did not prevent it, while 11 and 12 hrs. resulted in a noticeably slower response than 14 or 15 hrs. 13 hrs. resulted in a slightly slower, and all night lights a slightly more rapid, response than 14 or 15 hrs. There was no difference in avg. egg production to the end of May between pens of birds on a 13 hrs. or longer day. The use of artificial light to lengthen the day up to 15 hrs. did not have any consistent effect on hatchability when compared with unlighted birds.—*V. S. Asmundson.* (Biological Abstracts)

BIELLIER, H. V., and C. W. TURNER. *(U. Missouri, Columbia.)* THE THYROXINE SECRETION RATE OF GROWING WHITE PEKIN DUCKS. *Poultry Sci. 29:* 248-259. 1950.—The thyroxin secretion rate of growing White Pekin ducklings was estimated by determining the amt. of D,L-thyroxin injd. daily which was required to correct the goitrogenicity of 0.1% thiouracil admd. in the complete ration. The detns. were made at 3-week intervals continuing to 12 weeks of age. The daily rate of secretion by the thyroid gland of White Pekin males expressed as μg. of D,L-thyroxin ranged from 13.9 μg. (2.85 μg. per 100 g. body wt.) at 3 weeks of age to 60 μg. (3.18 μg. per 100 g. body wt.) at 12 weeks of age. The daily rate of secretion by the thyroid of White Pekin females was slightly greater than that of the males, ranging from 14 μg. (2.67 μg. per 100 g. body wt.) at 3 weeks of age to 61.4 μg. (3.39 μg. per 100 g. body wt.) at 12 weeks of age. The feeding of 0.1% thiouracil alone stimulated greater hypertrophy of the thyroid of the duck than of any species reported. It also had the effect of increasing testis wt. and depressing ovary wt.—*Authors.* (Biological Abstracts)

BOOKER, E. E., and PAUL D. STURKIE. *(Rutgers U., New Brunswick, N. J.)* RELATIONSHIP OF RATE OF THYROXINE SECRETION TO RATE OF EGG PRODUCTION IN DOMESTIC FOWL. *Poultry Sci. 29:* 240-243. 1950.—Thyroxin secretion rate was determined in birds with 2- and 4 egg cycles by the method of Mixner et al. in Mar. and Apr. of the 1st laying year of White Leghorns. The daily secretion rate for the birds of the 2- and 4-egg cycles were 10.75 and 14.3 μg. of D,L-thyroxin. The percentages of production for these groups one month prior to the test were 53.79 and 67.21, respectviely. The following year another group of birds was studied. The daily secretion rate for the 2- and 4-egg cycle birds were 9.85 and 12.25 μg. of D,L-thyroxin respectively. The rates of production for these groups one month prior to the test were 56.6 and 72.2%, respectively. The study suggests that secretion rate may play a role in the detn. of cycle length but not the interval between cycles.—*Authors.* (Biological Abstracts)

BOONE, M. A., J. A. DAVIDSON, and E. P. REINEKE. *(Michigan State Coll., East Lansing.)* THYROID STUDIES IN FAST AND SLOW-FEATHERING RHODE ISLAND RED CHICKS. *Poultry Sci. 29:* 195-203. 1950.—Expts. were conducted to determine (1) the response of slow-feathering R. I. Red chicks to several levels of thyroprotein admn., and (2) the comparative thyroid secretion rates of fast and slow-feathering strains of R. I. Reds. The estimated thyroid secretion rate expressed in terms of D,L-thyroxine was 2.17 and 2 μg. daily in the males and females, respectively, of the slow-feathering Reds and 1.98 and 2 μg., respectively, in the males and females of the fast-feathering strain. Expressed as μg. per 100 g. of body wt. these values are as follows: slow-feathering males 1.55; slow-feathering females 1.5; fast-feathering males 1.62; and fast-feathering females 1.6. No consistent increase in body wt. gain was noted at thyroprotein dosage levels ranging from 2.25 to 36 g. per 100 lbs. of feed. Some retardation of growth was observed at 72-g. level. Low levels of thyroprotein did not show significant differences in rate of feathering. Significant increases in feathering were noted on levels of 9-72 g. of thyroprotein per 100 lbs. of feed. Feathering increased in proportion to the dosage up to 36 g. and leveled out thereafter. No evidence was found to indicate that the slow-feathering trait in this strain of R. I. Reds is due to an inherently low thyroid secretion rate.—*J. A. Davidson.* (Biological Abstracts)

BRANSON, HERMAN, MARTIN BROOKS, and PAULINE F. PIPER. *(The Graduate School, Howard University, Wash., D.C.)* THE ORDER OF UTILIZATION OF PHOSPHORUS COMPOUNDS IN THE EGG BY THE CHICK EMBRYO. *Science, 112:* 357, September 29, 1950.—The organic phosphorus compounds are hydrolyzed outside the embryo (possibly by a phosphatase released by the embryo or by the activation of a phosphatase by the embryo), and the inorganic phosphorus produced is then taken up by the embryo. Otherwise, our data

would require that both the organic phosphorus and the inorganic phosphorus enter the embryo, since we have repeated the experiment proving that inorganic phosphorus does not label the organic phosphorus when radioactive inorganic phosphorus is stirred with the yolk and permitted to stand at room temperature for several hours. This experiment shows that there is in the yolk no equilibrium of the type: organic phosphorus inorganic phosphorus. (Experiment Station Record)

BUCKNER, G. DAVIS, W. M. INSKO, JR., AMANDA HARMS HENRY, and ELIZABETH FAULL WACHS. *(Agric. Expt. Sta., Lexington, Ky.)* THE GROWTH AND CALCIFICATION OF THE HUMERI OF MALE AND FEMALE NEW HAMPSHIRE CHICKENS HAVING CROOKED KEELS. *Poultry Sci. 28:* 644-649. 1949.—At 2-wk. intervals from the 6th to the 28th wk. of growth, the humeri were dissected out from 5 male and 5 female New Hampshire chickens having crooked keels. Data concerning these bones were compared with similar data from chickens having straight keels. No significant differences were found in rate of growth of the humeri of males and of females, as shown by the avg. wts., vols., and lengths, until after the 14th wk., when those of the males became heavier, larger, and longer. The avg. biweekly growth in length of humerus was nearly the same in the male and female chickens; however, the humerus of the male was consistently longer for 28 wks. For each sex the growth was practically the same as in those having straight keels. The avg. percentages of ash in the fat-free dry humeri were nearly the same in the males and females, straight keels and crooked keels, at the 14th wk., after which time until the 24th wk. the percentage was higher in females having straight keels than in those having crooked keels. The growth of the humerus is an orderly enlargement and the increase in size of the bone is accompanied by increase in size of air space within. The air space is caused by the solution or change of bone by the action of osteoclasts from within and the deposition of bone of like character on the outside under the periosteum by the action of osteoblasts.—*G. D. Buckner.* (Biological Abstracts)

BURGER, J. WENDELL. A REVIEW OF EXPERIMENTAL INVESTIGATIONS ON SEASONAL REPRODUCTION IN BIRDS. *The Wilson Bulletin, 61:* 211. December, 1949.—The experimental data are yet too fragmentary to explain seasonal reproductive rhythmicity the world over, if indeed a single unified theory is possible. Genetic selection in poultry has been able to modify reproductive rhythmicity, giving evidence that natural selection has utilized the genetic variability from which species differences can be built. There is no evidence for any species of bird that its reproductive rhythmicity occurs independently of controls in the external environment. In certain species, at least, there is a difference in the factors effective in the two sexes.

How light effects pituitary stimulation is largely unknown. The theory as currently phrased, that light acts indirectly by promoting increased hypothalamic activity through longer bodily activity or wakefulness, stands "not proven." The alternative view that light acts in a less indirect fashion has more experimental substantiation, but it too is "not proven." . . . Photoperiodic changes are the only widely spread factors capable of modifying reproductive rhythmicity which is moderately well-known through experimental testing. (Experiment Station Record)

ERNSTING, MEINE JAN EITS, and WYBE THOMAS NAUTA, assignors to N. V. Koninklijke Pharmaceutische Fabrieken V/R Brocades-Stheeman and Pharmacia. *(Netherlands.) Animal Feed.* U. S. Patent 2,504,401; Appln. Netherlands, July 26, 1947; Issd. April 18, 1950.—An animal feed for increasing animal wt. gain contains 4-methyl-2-thiouracil. 10- to 14-wk. old chickens given normal feed gave 100% 2d grade birds after 10-12 days; similar chickens given normal feed with a usual fattening treatment gave 10% first rate, 45% first grade, and 45% second grade; similar chickens given 50 mg./day of 4-methyl-

2-thiouracil in the feed gave 25% first grade, 75% second grade; and chickens given a combination of the 2d and 3d treatments gave 90% first rate, 10% first grade. (Biological Abstracts)

FUNK, E. M. *(U. Missouri, Columbia.)* THE RELATION OF BODY WEIGHT OF TURKEY HENS TO EGG PRODUCTION, EGG WEIGHT, PERCENTAGE OF HATCH AND VIABILITY OF POULTS. *Poultry Sci. 29:* 64-66. 1950.—An analysis of records made by 226 White Holland and 172 Bronze turkey hens on 2 Missouri U.S.R.O.P. turkey breeding farms showed that within these 2 strains the eggs laid by the smaller hens hatched better than those laid by the larger hens. Egg wt. and body wt. were positively correlated. Egg production and poult viability were not associated with body size.—*E. M. Funk.* (Biological Abstracts)

GRAHAM, W. R. HORMONES AND THEIR VALUE IN FEEDS. THREE TYPES BEING CONSIDERED BY NUTRITIONISTS. *The Feed Bag, 26(8):* 21, August 1950.—Of tremendous importance is the pituitary gland, which lies just beneath the brain and just above the palate. This gland is the major or controlling gland in the production and utilization of hormones throughout the body.

Unfortunately, these pituitary hormones are protein in nature, and the protein types are very difficult to synthesize and manufacture. In that respect, they are very much like insulin.

Thyro-active products are already being put to practical use in feed industry. For example, if you want an animal to increase its productive work, you give it more thyroxin, but if you want the same animal to slow down, put on fat and not eat too much, you give it an anti-thyroid product.

There is actually an "anti-thyroid hormone." It is a product of the pituitary gland, however, one of those which we have not learned to produce artificially. Fortunately, we have a synthetic product called thiouracil. It is a thyroid-blocking agent which prevents the thyroid gland from picking up iodine. Since iodine is the major portion of the thyroid hormone itself, the work rate of an animal which is denied iodine declines steadily.

As for broilers, it is definitely established that thyroprotein will put more feathers on them.

Here is a curious fact concerning the use of thiouracil to slow down the thyroid activity of broilers. It is probably practical to use some thyro-protein—a speeding-up agent—along with the thiouracil. At first glance this seems strange, but it is easily explained. You originally use thiouracil to slow down the thyroid. After four or five weeks on thiouracil, however, the thyroid gland becomes completely blocked and the animal does not want to eat much feed. And if an animal raised for meat production does not want to eat, then you will never get any meat to send to market. (Experiment Station Record)

HARPER, J. A. *(Oregon State Coll., Corvallis.)* CHANGES IN BODY WEIGHT AND CONFORMATION OF BROAD BREASTED BRONZE TURKEYS DURING THE BREEDING SEASON. *Poultry Sci. 29:* 98-103. 1950.—Observations were made during the breeding season on 147 Broad Breasted Bronze hens and 20 toms to measure changes in body wt., breast width, keel length and shank length. Max. body weight for hens lighted Jan. 15 was reached at the bi-weekly period of Feb. 11, thereafter a gradual decline occurred to May 17 when the expt. ended. Males were found to follow a similar pattern in body wt. change as for hens when in breeding pens. Males not used in breeding pens increased in wt. Breast width changes in males and females were small and followed the curve for body wt. Only slight changes were noted in keel length for both males and females. Shank length of both sexes increased during the breeding season, being greater for males than the females.—*J. A. Harper.* (Biological Abstract)

HAYS, F. A. *(Massachusetts State Coll., Amherst.)* SEX INFLUENCE ON EMBRYONIC DEATH RATE IN CHICKS. *Science 110:* 533. 1949.—Studies on 5450 eggs laid from Feb. 5 to Mar. 25, 1949, by a flock of R. I. Reds show that the higher the early embryonic mortality (death of embryo up to 5 days of incubation), the higher the ratio of surviving males to surviving females at 8 weeks post-hatching. This indicates that there is a preponderance of female deaths in early embryonic life.—*F. F. Sheldon.* (Biological Abstracts)

HERTZ, ROY, F. G. DHYSE, and WM. W. TULLNER. ELEVATION OF BIOTIN ACTIVITY IN THE SERUM OF ESTROGEN TREATED CHICKS; RELATIONSHIP TO HORMONE-INDUCED AVIDIN FORMATION IN THE OVIDUCT. *Endocrinology 45:* 451. 1949.—Total biotin activity is elevated about five-fold in the blood of the estrogen-treated sexually immature chick. This increase in biotin activity is found in both the fat-soluble fraction (i.e. the FSF of Trager) and in the acid hydrolyzable (or true) biotin. Although simultaneous administration of progesterone with the estrogen induces avidin or antibiotin formation in the oviduct, there is no alteration in the degree of elevation of blood biotin-activity. It is considered that the hormonal induction of increased levels of biotin activity in the blood and the parallel endocrine stimulation of avidin or antibiotin formation in the female genital tract suggest that these metabolites may play a significant role in the physiology of reproduction. (Experiment Station Record)

HOFFMAN, EDMUND. *(U. Georgia, Athens.)* THYROXINE SECRETION RATE AND GROWTH IN THE WHITE PEKIN DUCK. *Poultry Sci. 29:* 109-114. 1950.—The thyroxin secretion rate of White Pekin ducklings for the period from 1 to 3 weeks of age was shown to be 18.7 μg. per bird per day or 3.8 μg. per 100 g. of body wt. This is approx. double the thyroxin secretion rate of chickens of comparable wt. Circumstantial evidence for a relationship between thyroxin secretion rate and early rapid growth as well as early maturation is reviewed. It is suggested that the growth pattern of the duck is further evidence of an intrinsically high thyroxin secretion rate.—*Edmund Hoffman.* (Biological Abstracts)

HOHN, E. O. *(U. Alberta, Canada.)* SEASONAL CHANGES IN THE THYROID GLAND AND EFFECTS OF THYROIDECTOMY IN THE MALLARD, IN RELATION TO MOULT. *Amer. Jour. Physiol. 158:* 337-344. Illus. 1949.—Histological observations on 24 adult male and 16 adult female mallards indicate 2 seasonal phases of increased thyroid activity—one affecting both sexes from Oct. to Jan., the other preceding the first, more extensive moult by about one month, occurring in males from April to late May and in females, which moult about 1 month later, in June. A 2d, much more transient period of increased thyroid activity may precede the less extensive 2d moult. In 3 birds, operated 2 months before the expected moult from juvenile to first breeding plumage, which survived a 6-month period of observation after complete thyroidectomy, the moult was not prevented or postponed, though one bird failed to moult its abdominal feathers. Three females showed a deviation from the normal macroscopic thyroid pattern, the 2 lobes being united caudally across the midline of the neck in 2 birds; in another the left thyroid was absent but the right hypertrophied. Mean wts. of thyroid tissue were 88.9 mg./kg. body wt. in males and 100.8 mg./kg. body wt. in females.—*Auth. summ.* (Biological Abstracts)

HUBLE, J. *(U. Gent.)* LANGDURIGE BEHANDELING VAN DWERGHOENDERS MET EEN GROEIBEVORDEREND EXTRACT UIT DE VOORKWAB DER HUNDERHYPOPHYSE. [PROLONGED TREATMENT OF DWARF CHICKENS WITH A GROWTH-PROMOTING EXTRACT FROM BEEF ANTERIOR PITUITARY.] *Natuurwetenschap. Tijdschr. 31:* 201-205. Illus. 1949.— Eighteen dwarf chickens, both pullets and cockerels, of different races, were divided into 9 groups. In each group one litter-mate served as a control. An alkaline

extract of fresh beef pituitaries was made and injected daily for 6 mos. in monthly increasing doses of 70-230 rat units. The injected animals (original mean wt. 438 g.) showed a more prolonged increase in wt. before reaching a level (final mean 610 g.) than the controls (start 385 g., final 500 g.). The treated animals showed a pronounced reduction of sexual development in both sexes. Histological observation and control expts. showed that the extract used had no thyrotropic action. —*C. A. G. Wiersma.* (Biological Abstracts)

ITO, M., and F. UENO. INFLUENCES OF SOME HORMONES UPON THE HEN'S LAYING. *Folia Endocrinol. Jap.* 22(7/12): 28-30. 1946.—Fifteen capon-units of androgen, injd. into the laying hen, induced smaller eggs and cessation of laying in a few days. If 8 or 12 capon-units of androgen are injd. daily, the interval of laying is apparently prolonged but never entirely stopped. 1000 or 2000 units of estrogen injd. continuously into the laying hen had no clear influence on the laying. If 100 M. U. of gonadotrophin are injd. into a laying hen once a day, there is no clear influence upon the laying; injn. of 1000 or 2000 M. U. daily stops laying on the 7th or 10th day; if the injn. is interrupted in such case, the laying commences again after 3-8 days. Hemorrhagic follicles are present in ovaries of gonadotrophin-injd. hens.—*K. Suzue.* (Biological Abstracts)

JUHN, MARY. *(University of Maryland.)* FEATHER GROWTH IN SEBRIGHT BANTAMS OF HENNY, INTERMEDIATE, AND COCKY PLUMAGE. *Journal of Experimental Zoology, Vol. 112:* 109. 1949.—Three Gold Sebright Bantam cocks were selected for the separate plumage pattern exhibited by each of these individuals. Comparable regions of the breast and saddle tracts were defeathered and the axial increments of regenerating feathers of identical position recorded for comparison in order to observe possible feather growth-pattern relations.

Male S-2 possessed henny feathering and male S-3 intermediate plumage, tending toward henny. Feather growth in the regenerating breast and saddle feathers of these two birds proceeded in very similar measure and over comparable periods. Male S-1 was cock-feathered and in this bird regeneration proceeded more slowly and for a longer time in the saddle than in the breast. This regional diversity is as characteristic of the male as is the regional uniformity seen in the other two Bantams of the female, in the normal cock-feathered breeds. (Experiment Station Record)

KOSIN, I. L. *(Washington Agric. Expt. Sta., Pullman)*, and W. J. WAKELY. *(Dominion Exptl. Farm, Lethbridge, Alberta.)* PERSISTENCY OF THE FUNCTIONAL CAPACITY OF BREED-HETEROLOGOUS TURKEY SEMEN. *Poultry Sci. 29:* 258-263. 1950.—When semen, obtained from the Broad Breasted Bronze toms, was repeatedly inseminated into the Beltsville Small White hens which only recently had been mating with the Beltsville Small White toms, the white down poults continued to appear, in some cases, for 8 weeks following the removal of the white toms. The control hens received Beltsville Small White semen. Five weeks after the 1st insemination, the hen treatment groups were reversed and observations were made on the down pattern of the subsequently hatched poults. The semen carried over from the 1st series of inseminations appeared to retain its fertilizing capacity for at least 5 weeks. If the white of the Beltsville Small White is invariably recessive to the bronze pattern of the Broad Breasted Bronze breed, then one must conclude that the fertilizing capacity of the turkey semen can persist for as long as 8 weeks while within hen's oviduct.—*I. L. Kosin.* (Biological Abstracts)

KUSHNER, C. F. [THE EFFECT OF INSEMINATION OF HENS WITH A SPERM MIXTURE ON THE DEVELOPMENT OF THE OFFSPRING.] *Agrobiologiia 1948:* 128-138. 1948.—The theory and numerous expts. about pollen mixtures are discussed. Trios of sister hens were placed one in each of 3 pens, each pen having 22 hens. The

hens in one pen were fertilized by one rooster, those in the 2d by another, and those in the 3d by both roosters alternating through the day. The progeny of the hens fertilized by 2 cocks showed greater viability, live wt., and percentage hemoglobin than did the progeny of the other pens. This was true not only of the pens as a whole, but also of the progeny of a single trio.—*Richard Levin.* (Biological Abstracts)

LORENZ, F. W. *(U. California, Davis.)* ONSET AND DURATION OF FERTILITY IN TURKEYS. *Poultry Sci. 29:* 20-26. 1950.—Trapnested Broad Breasted Bronze turkey hens were used in this study of artificial insemination. The minimum optimum dose of semen was found to be 1/40 ml., with maximum fertility reached soon after the 2d day; 11.4% of the eggs were fertile on the day following insemination. Fertility remained at a maximum for 3 weeks after insemination and declined thereafter for 6 weeks although some fertile eggs were secured after 8 or 10 weeks.—*Lawrence Morris.* (Biological Abstracts)

McCARTNEY, MORLEY G., and C. S. SHAFFNER. *(U. Maryland, College Park.)* CHICK THYROID SIZE AND INCUBATION PERIOD AS INFLUENCED BY THYROXINE, THIOURACIL, AND THYROPROTEIN. *Poultry Sci. 28:* 223-228. 1949.—Observations were made on the incubation period of eggs and the thyroid wts. of the chicks produced by normal females and females fed thyroprotein (10 grams/100 pounds) or thiouracil (0.3 and 0.1%), and females injected with thyroxin (20, 40 and 100 μg. daily). Eggs from untreated females were injected with thyroxin or thyroprotein and similar observations made on the chicks hatched. The thyroid activity of representative samples of all chicks was detd. by the closed-vessel technique. The thyroid glands of chicks from thyroprotein-fed and thiouracil-fed females were 78 and 54.3%, respectively, heavier than those of the chicks from the control females, the difference being highly significant. The thyroid glands of the chicks hatched from the thyroxin-injected females and the thyroprotein-injected eggs were comparable in size to the thyroid glands of normal chicks, while the thyroid glands of the chicks from the thyroxin-injected eggs were significantly smaller than those of the control chicks. The incubation period of the eggs from the thyroprotein-fed females was 12.3 hrs. longer than those from the controls. The incubation period of the eggs from the females receiving thiouracil at a level of 0.3 and 0.1% was 26.6 and 11.9 hrs., respectively, longer than the control eggs. Evidence is submitted indicating that the retardation in incubation period of the eggs produced by the thyroprotein-fed and the thiouracil-fed females is proportional to the increase in the size of the thyroid glands. The closed-vessel survival time observations indicate that the thyroidal activity of the chicks from thyroprotein-fed and the thiouracil-fed females is lower than in normal chicks, indicating a lowered metabolic rate and a functional hypothyroid condition.—*Authors.* (Biological Abstracts)

McCARTNEY, MORLEY G., and C. S. SHAFFNER. THE METABOLIC RATE AND THYROID SIZE OF CHICKS FROM DAMS WITH ALTERED METABOLISM. *Endocrinology, 45:* 396, 1949.—Three groups of New Hampshire females, 20 per group, were each maintained on a control ration, a ration containing 0.022 percent thyroprotein, and a ration containing 0.1 percent thiouracil, respectively. After 12 weeks the resting metabolism of the thyroprotein-fed and the thiouracil-fed females was 12 percent more and 24 percent less, respectively, than that of the control females.

Day-old chicks produced by each of the two groups of treated females required about 16 percent less oxygen than the control chicks. The results of the metabolism studies indicate that chicks produced by both hyperthyroid and hypothyroid females are themselves hypothyroid.

About 6 micrograms of exogenous thyroxine were necessary to affect thyroids of normal size in chicks hatched from eggs laid by thyroprotein-fed females. Aqueous solutions of thyroprotein or KI injected into control eggs had no effect on chick thyroid size. (Experiment Station Record)

McCARTNEY, MORLEY G., and C. S. SHAFFNER. *(U. Maryland, College Park.)* THE INFLUENCE OF ALTERED METABOLISM UPON FERTILITY AND HATCHABILITY IN THE FEMALE FOWL. *Poultry Sci. 29:* 67-77. 1950.—Three groups of New Hampshire females, 20 per group, were maintained on a control ration, on a ration containing thyroprotein (0.022%) and on a ration containing thiouracil (0.3 or 0.1%), respectively. In the 1st trial these treatments were continued for 24 weeks and in the 2d trial for 12 weeks. The rate of oxygen consumption was measured at 4-week intervals. After 12 weeks of treatment, the avg. rate of O_2 consumption of the thyroprotein-fed and thiouracil-fed (0.1%) females was 12% more and 24% less, respectively, than that of the controls. In both trials the treatments had no effect on fertility; however, the higher level of thiouracil (0.3% decreased hatchability and egg production. The feeding of thyroprotein resulted in considerable comb enlargement and a decrease in body wt. The treatments had no effect on egg size or on the sex ratio of the chicks.—*C. S. Shaffner.* (Biological Abstracts)

MORGAN, C. L., JAMES B. COOPER and M. A. BOONE. SEXUAL ACTIVITY OF TURKEY TOMS NOT STIMULATED BY THYROID HORMONE. *Sixty First Annual Report of South Carolina Agr. Exp. Sta., Clemson, S. C.,* page 57, 1950.—In two trials no differences were noted in these factors in toms fed thyroid hormone in the ration and those receiving the same ration without the hormone. The feeding of iodocasein to turkey hens at the same rate has been found to increase the average egg production of unselected birds. (Experiment Station Record)

MUKHERJEE, D. P., and P. BHATTACHARYA. *(Indian Vet. Res. Inst., Izatnagar.)* SEMEN STUDIES AND ARTIFICIAL INSEMINATION IN POULTRY. *Indian Jour. Vet. Sci. and Animal Husbandry 19:* 79-85. 1949.—Semen from 1-yr.-old White Leghorns and country birds of the same age was examined. The following results were obtained with the country strain and Leghorns, respectively: volume 0.182-0.335, 0.304-0.43; pH 6.6-6.8, 6.4-6.8; sperm concn. 1635-3287, 2891-3852 million/ml.; total number of spermatozoa 491-1012, 1191-1266 millions; mean % of abnormal spermatozoa 3.2-4.08, 3.68-3.8. The fertility in White Leghorns and Rhode Island Reds inseminated with semen of country birds was 82.21%, and in those inseminated with (L) semen 88.73%.—*N. N. Dastur.* (Biological Abstracts)

NEWELL, GEORGE W., and C. S. SHAFFNER. *(U. Maryland, College Park.)* BLOOD VOLUME DETERMINATIONS IN CHICKENS. *Poultry Sci. 29:* 78-87. 1950.—A procedure is presented for determining the blood volume of chickens which is a modification of earlier techniques in that only 2 ml. of blood need be withdrawn. Data are presented in support of the technique showing that there is close agreement between the calculated and measured volumes of in vitro samples. Repeated detns. on the same birds showed close agreement. Regression curves are given for the blood volume and body wt. of 113 females and 110 males of the New Hampshire breed. These curves indicate that a curvilinear relationship exists between blood volume and body wt., the blood comprising approx. 10% of the body wt. of young chickens of either sex. Above 800 g., however, the curves for the sexes differ markedly. The volume of blood cells, as a % of total blood volume, remained almost constant in females, while in males this % increased rapidly beyond sexual maturity. Birds treated with thiouracil had significantly less blood than control birds of an equal wt., indicating that wt. increases that result from this treatment are due to the deposition of fatty tissue which is low in blood content.—*C. S. Shaffner.* (Biological Abstracts)

PARKER, J. E., and J. A. HARPER. *(Oregon Expt. Sta., Corvallis.)* THE RELATION OF BREAST WIDTH AND BODY WEIGHT TO REPRODUCTION IN TURKEY HENS. *Poultry Sci. 29:* 305-306,

1950.—Observations with Broad Breasted Bronze turkey hens show that either initial breast width or initial body wt. taken on Jan 14 had litle or no relationship to the avg. number of eggs laid or the avg. number of poults produced. Averages of 3 breast width measurements and of biweekly body wts. taken during the breeding season also had little or no relationship to egg or poult production. There was some evidence that the narrower breasted females produced a higher percentage of fertile eggs, but the wider breasted females had higher hatchability of fertile eggs. Body wt. had no consistent effect on either fertility or hatchabiliy of fertile eggs.—*Authors.* (Biological Abstracts)

PAULSEN, TWILA M., A. L. MOXON, and W. O. WILSON. *(S. Dakota Agric. Expt. Sta., Brookings.)* BLOOD COMPOSITION OF BROAD-BREASTED BRONZE BREEDING TURKEYS. *Poultry Sci.* 29: 15-19. 1950.—Hemoglobin, Ca, inorganic P, carotene and vitamin A were detd. on blood samples taken from 20 turkey hens before they started to lay and 6 times (at 4-week intervals) during the laying season in 1944. Four toms were bled on the same dates. Hb levels in the hens decreased gradually from 13.2 g. to 9.6 g.; the Hb levels for the toms decreased from 14 g. to 12.5 g. for the same period. There was a direct correlation between blood Ca and egg production with a mean level of 9.25 mg. before the hens started to lay and a mean of 25.47 mg. at the peak of egg production. The highest individual value for Ca was 43.18 mg. Mean inorganic P values went from 4.41 mg. to 7.09 mg. Ca and P levels for the toms remained rather constant. Plasma carotene mean values were 0.3082 mg. at the start, dropped to 0.0842 mg. by Feb. and remained low until the last bleeding but rose to 0.3932 mg. when the birds had been on green range for 2 weeks. Plasma vitamin A values showed changes similar to carotene with mean values of 0.1366, 0.0665 and 0.1405 at the start, peak of egg production, and the last bleeding. In 1945, 18 turkey hens were bled before they started to lay and at their peak of production. Blood values were similar to those found on comparable dates in the birds bled in 1944.—*A. L. Moxon.* (Biological Abstracts)

PETERSEN, DONALD F., ALVIN L. MOXON, and WILLIAM KOHLMEYER. *(S. Dakota State Coll., Brookings.)* CHANGES IN BLOOD CALCIUM, PHOSPHORUS, MAGNESIUM, SODIUM, AND POTASSIUM LEVELS RESULTING FROM EGG PRODUCTION IN THE BROAD BREASTED BRONZE TURKEY. *Proc. S. Dakota Acad. Sci. 28:* 69-73. 1949.—Plasma and whole blood values for Na, K, Ca, Mg, and P were detd. for the Broad Breasted Bronze turkey. During egg production, Ca and Mg levels are elevated markedly, Na; K, and P values for both whole blood and plasma very slightly. The decreases in plasma values for Na and K probably result from increases in plasma Ca, Mg, and P.—*From auth. summ.* (Biological Abstracts)

REIS, J. L. M. INSEMINACAO ARTIFICIAL EM GALLUS DOMESTICUS. *Bol. Inseminacao Artificial 2:* 85-105. 1945.—Semen samples from 2 B.P. Rock, 2 W. Leghorn, and 7 mongrel Leghorn (without remiges) males were studied. Burrows-Quinn technique was used. Vol. per male per collection ranged from 0.1 to 0.7 cc.; pH from 7.04 to 7.14; % abnormal sperm from 5 to 8; and sperm per cu. mm. from 1.15 to 1.68 million. Because of their considerably greater tail length, the sperm from mongrel Leghorn males averaged 116μ in total length as compared to 91 for White Leghorn sperm and 94 for B.P. Rock sperm. Comparative data on color, density, motility and % dead sperm are also given.—*F. P. Jeffrey.* (Biological Abstracts)

ROMANOFF, ALEXIS L. *(Cornell University)* THE PROBLEM OF INFERTILITY. *Northeastern Poultryman*, page 6, December, 1949. —At Cornell, two techniques have been used in studying the properties that distinguish unincubated fertile eggs from infertile. By the use of one method, it was found that there is a difference in bio-electric potential

(animal electricity) between the albumen of the fertilized egg and the blastoderm, the small whitish spot on the yolk where the embryo is located. This potential difference is greater than it is between corresponding spots in the infertile egg and can be artificially increased even further by exposure to ultraviolet or to X-rays in harmless dosage. At present, these tests must be performed on opened eggs, but the results are valuable because they indicate the direction further research should take.

The second method indirectly measures the physical and chemical changes due to fertilization as shown by conductivity and dielectric effect when the intact egg is placed in a radio-frequency electro-magnetic field. The average readings obtained from small groups of fertile eggs are significantly different from those given by the same number of infertile eggs. Although this technique is not as yet applicable to individual eggs, it may possibly become so after further fundamental investigation. (Experiment Station Record)

ROMIJIN, C. *(State U., Utrecht, Holland.)* FOETAL RESPIRATION IN THE HEN. GAS DIFFUSION THROUGH THE EGG SHELL. *Poultry Sci. 29:* 42-51. 1950.—Apparatus and tests were set up and conducted to determine the rate of gas diffusion through various sections of the egg shell. Diffusion rates were detd. for CO_2, H_2, O_2, and N_2, under varying conditions of humidity and shell condition. The conclusions drawn were that the air space area of the shell plays the most important role in the supplying of oxygen to the embryo. Several factors other than air space area influence the rate of penetration, such as humidity, thickness of shell, condition of membrane, air movement, etc. —*Lawrence Morris.* (Biological Abstracts)

SPERBER, IVAR. *(Roy. Agric. Coll. of Sweden, Uppsala.)* THE FORMATION OF SULFURIC ESTERS OF PHENOLS IN THE CHICKEN. *Lantbrukshögskolans Annaler 16:* 446-456. 1949.—The formation of sulfuric esters (and glucuronides) in the chicken after the intramusc. injn. of small doses (71 mg.) of phenol, catechol, resorcinol, quinol and phloroglucinol was examined. Phenol and diphenols give rise to an excretion of glucuronides and sulfuric esters corresponding to at least 75% of the dose injected, phloroglucinol to some 20%. Glucuronide formation seems to play a smaller role in the detoxication of phenol and catchechol, the smaller the amts. given. With these phenols the formation of sulfuric ester is by far the more important conjugation, when small doses are given. In the case of quinol at two dosage levels examined, there was no significant increase in glucuronide excretion. In the case of resorcinol, formation of glucuronide seems to be slightly higher than formation of sulfuric ester.—*Auth. summ.* (Biological Abstracts)

SZARSKI, H. *(U. Torun, Poland.)* HEAT RESISTANCE OF CHICKEN EMBRYO TISSUES IN VITRO. *Bull. Internat. Acad. Polonaise Sci. et Lettr. Cl. Sci. Math. et Nat. Ser. B: Sci Nat. (2) [Zool.] 1939 (7/12):* 351-360. 1946.—Tissue cultures of different organs were heated in waterbath for various periods of time in temp. +48°C. According to heat resistance the investigated tissues can be ranged in the following series, from the most susceptible to most resistant: migratory cells, epithelium of the intestine, skin epithelium, mesenchyme of the intestine, mesenchyme of the heart, mesenchyme of the skin, the mesenchyme and the epithelium of the amnion.—*H. Zzarski.* (Biological Abstracts)

SZIRAMI, JOHN A. *(Univ. of Amsterdam, Holland.)* THE EFFECT OF TESTOSTERONE PROPIONATE ON THE CONNECTIVE TISSUE OF THE HEAD APPENDICES AND THE SKIN OF THE CAPON. *The Anatomical Record, 105:* 337. 1949.—

1. It was demonstrated that the fiber substance of the connective tissue of the comb has all the qualities of collagen, except the swelling capacity at the lower pH's. It was concluded that there must be a factor suppressing the capacity for swelling.

2. During hormone therapy no changes occur in the elementary structure of the fibers of the capon's comb. Their appearance changes only morphologically, as they become separated and split into fine fibrils by the mucoid ground substance.

3. The reversible volume increase of the capon's comb after hormone treatment is due to an imbibition and loss of fluid by the ground substance in interstitial spaces. No cellular proliferation was observed during these changes.

4. Practically no alkaline phosphatase activity was found histochemically in the connective tissue of the comb. It was, however, present predominantly in the vessel walls during the imbibition and release phases. Simultaneously vasodilatation and vasoconstriction of the comb's circulatory system were observed.

5. The swelling experiments demonstrated that the body skin of the capon has the swelling properties of young skin, while the skin of the normal cock reacts in the swelling as mature, old skin. From these results it was concluded that in this case the male hormone is a significant factor for the normal development of the skin. (Experiment Station Record)

WHEELER, ROBERT S., and EDMUND HOFFMANN. *(U. Georgia, Athens.)* THE ETIOLOGY OF GOITER IN CHICKS FROM THYROPROTEIN-FED HENS; NEGATIVE ROLE OF INORGANIC IODIDE. *Poultry Sci. 29:* 306-307. 1950.—Although inorganic iodide fed to hens produces goiters in their chicks which are apparently identical to those produced by feeding synthetic thyroprotein, removal of the free iodide from thyroprotein does not reduce its goiterogenic action. Addition of a quantity of KI approx. twice that extracted from the thyroprotein has no additive effect. Since the histological appearance of the goiters resulting from KI and thyroprotein treatment of the hen are apparently identical, it is theorized that sufficient iodide may be liberated in the metabolism of the diiodotyrosine present in thyroprotein to account for these goiters.—*Authors.* (Biological Absrcats)

BLOOD-CELL COUNTS IN CHICKS CHANGED BY X-RAYS. Progress in Solving Farm Problems of Illinois. *Report* for 1947-48. page 64.—When day-old White Leghorn chicks were given an X-ray dosage of 360 r units, the number of lymphocytes in their blood was greatly reduced and there was a corresponding decrease in resistance to infection by *Salmonella pullorum*. The standard exposure used was at 85 KV, 3ma, at a distance of 40 inches for 120 minutes. When the same total dosage (360 r units) was given in a shorter time the effect on the blood cells was significantly reduced. (Experiment Station Record)

CHICKEN OVARY HAS ELABORATE BLOOD SUPPLY. Progress in Solving Farm Problems of Illinois. *Report* for 1947-48. page 62.—The venous system is extremely intricate and well developed in contrast to the relatively insignificant arterial system. This arrangement is well designed to bring about stagnation of blood in venous pockets and sinuses. The sinuses form an almost continuous band around the vitelline membrane so that nutrients are readily transferred from the blood to the yolk.

The venous system consists of three distinct layers, whereas the arterial system consists of two or three branches leading into each follicular stalk. (Experiment Station Record)

USE STILBESTROL-INHIBITED MALES AS TEST ANIMALS. Progress in Solving Farm Problems of Illinois. *Report* for 1947-48. page 63.—When the pituitary gland (hypophysis) is surgically removed from young male rats or chickens so that there is no further production of gonadotrophic hormones, these animals may be used to measure the kind and amount of these hormones in various preparations.

A substitute for surgical hypophysectomy was worked out by subcutaneous implantation of 15 milligrams of diethylstilbestrol, a synthetic estrogen. This drug completely inhibits the secretion of gonadotrophic

hormones, with resulting complete regression of the testes and atrophy of the secondary sex organs which are supported by androgen. (Experiment Station Record)

NUTRITION

ALMQUIST, H. J., and J. B. MERRITT. *(Grange Co., Modesto, Calif.)* PROTEIN AND ARGININE LEVELS IN CHICK DIETS. *Proc. Soc. Exptl. Biol. and Med. 73:* 136. 1950.—The arginine requirement for max. growth rate of the young Barred Rock-New Hampshire cross bred chick was found to be approx. 6% of the total protein in the diet at protein levels of 5, 20, and 30%.—*Authors.* (Biological Abstracts)

BAKER, WALTER. *(White Hall, Oreg.)* FEED FORMULA. *U.S. Patent 2,504,788; Appln. Oct. 23, 1946;* Issd. April 18, 1950.—A poultry feed contains mash material, Ca and P, and in addition 0.093-0.125 lbs./ton of KI to stabilize the assimilation of Ca and P. (Biological Abstracts)

BAUMANN, C. A. STABILITY OF VITAMINS IN FEEDS. *Proceedings First Nutrition School for Feed Men, University of Wisconsin, Madison.* August 28-29, 1950, page 15.—The carotene is wasted in two general ways: the first might be designated as "rapid initial losses," the second as the "slower, storage losses." Both types of loss must be prevented, if carotene is to be available to farm animals in adequate amounts at all seasons of the year. The first type of loss includes that which occurs in the plant itself as it matures. More important are the losses which occur immediately after the plant is cut in ordinary sun-drying of hay or ordinary silage making. Thereafter the slower storage losses continue. The amount of this latter in any one day is not great, but over the 4-12 months that the feed must be kept, virtually all of the carotene present at the beginning of storage may disappear.

At all times the chief destructive agent to carotene is the oxygen of the air. Destruction is greater at high temperature, in the presence of light and or of certain minerals that catalyze oxidation. In addition there is an enzyme carotene oxidase in fresh or dying plant material that speeds up the destruction of carotene. (Experiment Station Record)

BETHKE, R. M. MINERALS IN ANIMAL NUTRITION. *Proceedings First Nutrition School for Feed Men, University of Wisconsin, Madison.* August 28-29, 1950, page 9.—An analysis of the body of an animal will show a total of between 3 and 5 percent and a wide variety of mineral elements present. Experimentally, it has been found that the following fourteen are essential for normal nutrition of one or more species of farm animal: calcium, phosphorus, magnesium, chlorine, sodium, potassium, sulfur, iron, copper, cobalt, iodine, manganese, zinc, and fluorine. The last six in this group (copper, cobalt, iodine, manganese, zinc, and fluorine) are usually referred to as "trace elements." In addition to these fourteen, at least a dozen other mineral elements, like silicon, arsenic, lead, tin, boron, and molybdenum are usually present in animal tissue. Whether they are present there for a purpose or by accident is not known.

Of the fourteen, only eight, in addition to common salt, need be considered. These are calcium, phosphorus, iodine, copper, cobalt, iron, manganese, and fluorine. A deficiency of some of these in natural feeds is confined to certain geographical areas and the need for including the mineral element in the feed of the animal is confined to the deficient area. For example, the Great Lakes area is known to be deficient in iodine; whereas, the Coastal Plains of North Carolina abound in iodine. Similarly, cobalt deficiency has been noted under practical conditions in certain areas of this country, including northern Wisconsin and Michigan, and not in others. Likewise, iron deficiency occurs in cattle in

Florida and not in other sections of the country. (Experiment Station Record)

BIRD, FRANCIS H. *(Eastern States Farmers' Exchange, Inc., Rockville, Conn.)* THE "ANIMAL PROTEIN FACTOR" AND MORTALITY IN CHICKS. *Poultry Sci. 29:* 314-315. 1950.—The comparative effects of feeding vs. the injn. of APF concentrates on the growth and survival of APF depleted Rhode Island Red chicks are descr. All of the chicks fed the basal deficient diet were dead by 10 days. All chicks injected weekly with 1 μg. of vit. B_{12} survived the 21-day exptl. period. Mortality was variable in 2 groups fed commercial APF concentrates.—*F. H. Bird.* (Biological Abstracts)

BODA, DOMONKOS, and ARISTID G. B. KOVACH. *(Pázmány U., Budapest.)* IN WELCHER WEISE BEEINFLUSST ZWEIMAL UBERSTANDENE B_1-AVITAMINOSE DEN WIDERSTAND DES ORGANISMUS GEGENUBER FOLGENDER B_1-AVITAMINOTISCHER DIAT? [THE EFFECT OF TWO PREVIOUS SUBLETHAL AVITAMINOSES B_1 ON THE RESISTANCE OF THE ORGANISM TO SUBSEQUENT B_1-AVITAMINOTIC DIET.] *Arch. Biol. Hungarica 18:* 165-176. illus. 1948.—Thirty-four 1-yr.-old chickens of Hungarian "hempseed" strain were divided into 4 groups, 2 groups served as controls and received the usual feed and 2 groups were kept on an avitaminotic diet until beri-beri symptoms appeared. One group then received subcut. injns. of 5-15 g. vit. B_1 weekly in the 1st period. In the 2d period the same animals received an avitaminotic diet simultaneously with daily injns. of 100 μg. of vit. B_1 until fully recovered. Period 3 was a reiteration of period 1 until all animals showed once more symptoms of beri-beri. Then followed period 4 with a treatment with suitable doses of vit. B_1 and finally period 5 with a fully avitaminotic diet. The complete expt. lasted for 4 wks. The results proved that no adaptation exists against B_1-avitaminosis since the hens which had suffered twice from beri-beri and had recovered twice, again showed symptoms of beri-beri when kept on avitaminotic diet in an even briefer period than the control hens. The recovery of such hens from the 3d beri-beri affliction consisted chiefly of a disappearance of the neuritic symptoms and recovery of appetite without full recovery of the original body wt. There are human groups living on a diet poor in vit. B_1 and yet without typical beri-beri symptoms. This can be explained by the fact that various stages exist between lethal polyneuritis and other degrees of avitaminotic conditions characterized by different grades of diminished vitality.—*Istvan Finály.* (Biological Abstracts)

BOONE, M. A., C. L. MORGAN, and JAMES B. COOPER. MILO MAY REPLACE CORN IN BROILER RATIONS. *Sixty-First Annual Report of South Carolina Agr. Exp. Sta., Clemson, S. C.* May, 1950, page 55. (Experiment Station Record)

BURGOS, C. X., and M. RUFINO. *(Bureau of Animal Industry, Manila, Philippines.)* STUDIES ON IPIL-IPIL LEAF MEAL AS A PROTEIN FEED FOR CHICKS. *B.A.I. Recorder 12 (No. 5):* 27-36. 1950 *(Mimeographed).*—Ipil-ipil leaf meal cannot be used as a protein supplement in rations for growing chicks, although it can be said to materially help for such purpose at 5 per cent. As a forage, ipil-ipil leaf meal can be fed advantageously up to 5 per cent of the ration.—*F. M. Franda.*

CARVER, J. S., and JAMES McGINNIS. *(Washington State Coll., Pullman.)* EFFECT OF AN "ANIMAL PROTEIN FACTOR" FERMENTATION PRODUCT ON HATCHABILITY OF CHICKEN EGGS. *Poultry Sci. 29:* 307-309. 1950.—Ten groups of approx. 25 White Leghorn hens were fed a basal ration composed principally of cereal grains and soybean oil meal supplemented with either herring fish meal or graded levels of a fermentation APF prepn. Each of the 5 exptl. rations was fed to 2 groups of hens for a period of 9 weeks. All eggs

laid during this period were placed in the incubator at weekly intervals. The results on hatchability of fertile eggs showed that 2% fish meal gave high hatchability and that the basal diet gave poor hatchability. When the basal diet was supplemented with levels of 0.125, 0.25, or 0.50% of the fermentation APF hatchability was equally as good as that obtained with fish meal. The max. hatchability for any treatment in this expt. was an avg. of 92% for the 9-week period—*James McGinnis.* (Biological Abstracts)

CHARKEY, L. W., H. S. WILGUS, A. R. PATTON, and F. X. GASSNER. *(Colorado A. and M. Coll., Fort Collins.)* VITAMIN B_{12} IN AMINO ACID METABOLISM. *Proc. Soc. Exptl. Biol. and Med. 73:* 21-24. 1950.—In 2 expts., Single Comb White Leghorn chicks were grown on corn-soybean practical type rations, deficient in animal protein factor, with and without added vit. B_{12} (Merck APF supplement No. 3). Growth, food consumption, and thyroid wt. were recorded. Blood was analyzed for non-protein N, alpha amino N, erythrocytes, total amino acids, and arginine, lysine, methionine, tryptophan, histidine, threonine and valine. Vit. B_{12} supplementation of the diets led to faster growth, more efficient feed utilization, and reduced concns. in the blood of non-protein N and the individual amino acids. Vit. B_{12} appears to enhance utilization of circulating amino acids for building body tissues.—*L. W. Charkey.* (Biological Abstracts)

COLES, R., and A. R. PRESTON. CONDENSED FISH SOLUBLES IN POULTRY AND PIG FOODS. *Journ. of the Ministry of Agriculture,* August 1950, Vol. LVII, No. 5, page 205.—Since it is the animal protein factor which gives to protein from animal sources (fishmeal, meat meal, etc.) that observed advantage over vegetable protein, there has been diligent search for some reasonably easily available substance which carries the A.P.F. The value of such a material to British farmers who are having to rely largely on home-grown cereals and pulses for pig and poultry rations and are faced with a scarcity of animal protein, will be obvious. One such substance, which is now extensively used in U.S.A., is stickwater, which is the liquor pressed out during the manufacture of fishmeal.

Stickwater will normally contain water-soluble material derived from the fish, and its nature will therefore vary according to the species of fish used in the manufacture of the meal. The method of processing the meal, and subsequently the stickwater, will also affect their quality; certain manufacturing methods may destroy or impair the value of the nutrients contained in the meal and the stickwater, but, with any particular type of fish handled by an established process, it seems likely that the products would show only small variations in quality.

Stickwater is condensed to a viscous liquid containing 50 percent solids. A typical analysis of condensed fish solubles produced in the U.S.A. from a pilchard type of fish is as follows:

Protein	32 percent
Calcium (Ca)	0.87 percent
Phosphorus (P)	0.85 percent
Riboflavin	8-9 mg. per lb.
Choline	1500-1800 mg. per lb.
Niacin	150 mg. per lb.
B_{12}	1.4 mg. per grm.

(Experiment Station Record)

COMBS, G. F., C. W. CARLSON, R. F. MILLER, H. T. PEELER, L. C. NORRIS, and G. F. HEUSER. *(Cornell U., Ithaca, N. Y.)* STUDIES OF UNIDENTIFIED CHICK GROWTH FACTORS. *Jour. Biol. Chem. 182:* 727-737. 1950.—Concentrates of unidentified factors which promote early rapid growth in chicks fed exptl. diets in which all, or almost all, of the protein is of vegetable origin have been developed. Wilson's 95% alcohol soluble liver paste was used as the starting material. The unidentified factors were dialyzable and retained in appreciable quantities after purification which activated alumina and p-cresol.

The technic of counter-current distr. was used for the further purification, the solvent system being composed of a phenol-n-butyl alcohol layer in equilibrium with a dilute acetic acid soln. at pH 2. The fractions in all the tubes of the various single and superimposed counter-current distrs. were assayed for their vit. B_{12} content with *Lactobacillus leichmannii*. The resulting curves indicated the presence of 2 forms of vit. B_{12} in liver paste. Chick growth curves obtained by feeding these various fractions were quite different from the distr. curves. Their shape indicated the presence of 2 unidentified chick growth factors (or 2 forms of a factor) in addition to the 2 forms of the vit. B_{12}. Significant growth responses were obtained by feeding either of the unknown factors at levels at which the vit. B_{12} would have had no material growth-promoting effect. Some evidence of a mutual supplementary effect of the 2 unknown factors was obtained by feeding a combination of fractions containing them. In the presence of adequate vit. B_{12}, *L. leichmannii* responds to an unknown factor in the fractions containing the unidentified chick growth factors. *L. casei* also responds markedly. Whether the chick and microbiol. factors are identical cannot be detd. from the evidence.—*H. T. Peeler.* (Biological Abstracts)

COUCH, J. R., H. L. GERMAN, D. R. KNIGHT, PATRICIA SPARKS, and P. B. PEARSON. *(Texas A. and M. Coll., College Station.)* IMPORTANCE OF THE CECUM IN INTESTINAL SYNTHESIS IN THE MATURE DOMESTIC FOWL. *Poultry Sci. 29:* 52-58. 1950.—Broad-breasted Bronze mature turkey toms and White Leghorn pullets were each selected at random from flocks on range and killed. Cecal material from these birds contained a higher concn. of riboflavin, niacin, pantothenic acid, biotin and folic acid than did intestinal material taken from the same individual fowls. Fecal material from cecectomized White Leghorn pullets contained approx. the same amts. of the 5 B-vitamins listed above as did similar collections from normal birds. The effect of the removal of the cecum on the intestinal synthesis of biotin was studied by feeding a low biotin diet with starch as the carbohydrate to cecectomized and normal laying hens. Normal birds were fed sucrose in a low biotin diet as a negative control and similar ones were fed the same diet supplemented with this vitamin as a positive control. From the data obtained it is apparent that the cecum is not required for the synthesis of biotin when mature hens are fed starch as a source of carbohydrate in a low biotin diet. An indication was obtained to the effect that removal of the cecum enhanced the intestinal synthesis of biotin in the gastrointestinal tract of the laying domestic fowl.—*Authors.* (Biological Abstracts)

CRAVENS, W. W. VITAMIN B_{12} AND THE ANTIBIOTICS IN NUTRITION. *Proceedings First Nutrition School for Feed Men, University of Wisconsin, Madison.* August 28-29, 1950, page 24.—To date we know for chicks that streptomycin, penciillin, and terramycin will improve growth the same as aureomycin. There may be a difference in the quantity of these antibiotics required to give best growth but, nevertheless, they are all effective. Further it has been shown that phenylarsonic acid derivatives also give a stimulation in growth and some stimulation in growth has been noted when certain drugs used in the prevention of coccidiosis have been added to practical poultry rations. At the present time, therefore, we have vitamin B_{12} and the antibiotics in certain APF products and both give a stimulation in growth when added to rations composed largely of vegetable ingredients.

A combination of vitamin B_{12} and the antibiotics gives better growth than vitamin B_{12} alone. The data suggest however that the homogenized fish in combination with vitamin B_{12} and an antibiotic gave superior results. The same trend is also noticed when the yeast was added. (Experiment Station Record)

DRAPER, C. I. SUPPLY ESSENTIAL MINERALS IN REGULAR RATIONS OF HEN AND NOT IN EXPENSIVE SUPPLEMENTS. *Farm & Home Science, Utah Agr. Expt. Sta., 11(2):* 29, June 1950.—The

recently conducted experiment was as follows: two lots of laying pullets were fed and managed the same, except for the type of grit fed. The mash fed each lot came from a common batch mix, and the calcium content was equivalent to that recommended for egg production by the National Research Council. Egg production, pounds of feed required to produce a dozen eggs, mortality, and market value of the eggs were used as measures of the comparative value of the two grits.

The value of the eggs produced by the hens fed the high silica grit was considerably below that of the birds fed calcium carbonate grit. This may have been owing to the fact that the silica grit was palatable and consumed at the expense of the balanced mash feed. The grinding qualities of this grit were poor. (Experiment Station Record)

EKMAN, PER, HUGO EMANUELSON, and ALBERT FRANSSON. *(Roy. Agric. Coll. Sweden, Uppsala.)* INVESTIGATIONS CONCERNING THE DIGESTIBILITY OF PROTEIN IN POULTRY. USING A NEW METHOD OF CHEMICAL ANALYSIS FOR SEPARATING FAECAL NITROGEN FROM URINARY NITROGEN. *Kungl. Lanthrukshögskolans Annaler 16:* 749-777. 1949.—The authors during the last few yrs. have performed more than 100 digestibility expts. using their new method which they claim is simpler than the older ones, but nevertheless reliable. The trials have included several common feeding materials and have involved chickens, turkeys, and geese. The breakdown of the uric acid is brought about without boiling, in a nearly neutral soln. with a very slight excess of an oxidizing agent ($KMnO_4$). After the oxidizing agent has been allowed to act for 30 min. at 50°C., the protein is precipitated by addition of uranylacetate; this true protein precipitate is then filtered off and washed and the amt. of N present in it detd. In fresh newly excreted droppings and in such samples as have been dried quickly, the greatest part of the fecal N is present as true protein N. If the excreta are stored in the moist, some of the protein is exposed to biological and chem. decomposition to amino acids and other non-precipitable N compounds. In samples of feces free from urine, 90% of the total N was in the form of true protein. The remainder could be considered as soluble amide-N and this would represent 2-3% of the total N present in the mixed droppings.—*A. L. Bakke.* (Biological Abstracts)

GARTLEY, K. M., S. J. SLINGER, and D. C. HILL. *(Ontario Agric. Coll., Guelph, Canada.)* FURTHER OBSERVATIONS ON THE USE OF SUNFLOWER SEED OIL MEAL IN TURKEY STARTER RATIONS. *Poultry Sci. 29:* 312-313. 1950.—Sunflower seed oil meal was a satisfactory protein supplement for the growth of turkey poults when used at a level of 21% or less in a 28% protein starting diet fed for the first 4 weeks. From 4 to 8 weeks as much as 16.5% of sunflower seed oil meal resulted in satisfactory growth in a 0.26% protein mash. The results suggest that a higher dietary level of lysine is required for normal feather pigmentation than for optimum growth.—*K. M. Gartley.* (Biological Abstracts)

GISH, C. L. SUPPLEMENTING BROILER RATIONS WITH DISTILLERS SOLUBLES. *Transactions of the Kansas Academy of Science.* Vol. 52: 466. 1949.—Although not conclusive, the results show a general tendency for improvement of growth, and greater efficiency of feed utilization where D.D.S. and B. Y-500 were fed. (Experiment Station Record)

GREENBERG, SAMUEL M., CLARENCE E. CALBERT, HARRY J. DEUEL, JR. *(U. So. California, Los Angeles).* A. CHATTERJEE, and L. ZECHMEISTER. *(California Inst. Technol., Pasadena.)* A COMPARISON OF THE PROVITAMIN A ACTIVITY OF β-CAROTENE AND CRYPTOXANTHIN IN THE CHICK. *Arch. Biochem. 25:* 61-65. 1950.—The dosage and length of time required to get a straight line by plotting logarithm of dose and wt.-gain was determined for beta-carotene using white Leghorn roosters. Under the conditions of the

expt., opt. time was 21 days and opt. dosage for use in an assay procedure was 1-3 μg. The provit. A potency in the chick of al-trans-cryptoxanthin was found to be 55% of the potency of all-trans-beta-carotene when tested for its growth-promoting activity.—*S. M. Greenberg.* (Biological Abstracts)

HALBROOK, E. R., A. R. WINTER, and T. S. SUTTON. BUILT-UP POULTRY-HOUSE LITTER AS A GROWTH-PROMOTING SUPPLEMENT FOR CHICKS ON AN ALL-VEGETABLE VITAMIN B_{12}-DEFICIENT DIET. *Science, 112:* 308, September 15, 1950. (Experiment Station Record)

HERROLD, JOHN M. INSULATED "A" IN MIXED FEEDS. Unstable Vitamin A, a main source of loss in feeding values, can be trapped so it will "stay put." *Hatchery & Feed,* 23(12): 12. December, 1949.—The rate at which fish oil vitamin A and carotene deteriorate in mixed feeds depends upon numerous factors. These factors are:

1. Storage temperature.
2. Air circulation.
3. Exposure to light.
4. Fineness of ingredients.
5. Concentration of oxidizing minerals.
6. Concentration of anti-oxidants.
7. Concentration of other Vitamin A destructive feed ingredients.

After long effort, it is now possible to obatin vitamins A and D in a dry form in which both vitamins will remain thoroughly stable in ordinary feeds. In fact, this research has been so successful that the vitamin A, insulated in dry form, will also remain stable for many weeks and months in most commercial mineral preparations. From a generally practical standpoint, the problem has been solved. (Experiment Station Record)

HEUSER, G. F. ALFALFA MEAL FOR POULTRY. *Flour & Feed, 51(3):* 22, August 1950.—In the California experiments concentrates of an active principle were obtained from alfalfa which depressed the growth of chicks and which had hemolytic (i.e. dissolving of red blood cell) properties. In these experiments 20 percent of alfalfa meal was fed. This is an amount at least four times that ordinarily used. Levels of five percent or less did not produce growth depression. It was furthermore shown that the growth depressing action of the material, thought to be a saponin, was to a great extent counteracted by the feeding of cholesterol.

It would appear that chicks are most sensitive to the amount of alfalfa meal that can be included in the rations. It is commonly recognized that it probably should not exceed five percent in the chick diet. Mature chickens can tolerate much higher levels, in some cases as much as 10 percent being fed. Turkeys apparently can efficiently utilize greater amounts than chickens. (Experiment Station Record)

JAMES, EDWARD CLARK JR., and ROBERT S. WHEELER. *(U. Georgia, Athens.)* RELATION OF DIETARY PROTEIN CONTENT TO WATER INTAKE, WATER ELIMINATION AND AMOUNT OF CLOACAL EXCRETA PRODUCED BY GROWING CHICKENS. *Poultry Sci. 28:* 465-467. 1949.—Six pens of 8 chicks each were fed rations of 15, 20 and 25% protein. The protein content of the rations was altered by varying the amts. of corn and soybean meal. The chicks were kept in pens with wire floors. Records were kept of water and feed consumed, and wt. of droppings voided. The amt. of water consumed was directly related to the protein content of the feed, or the greater the protein content, the greater the water consumption. The avg. feed consumption was about the same for all hens. There was no significant difference in amt. of moisture for the various hens. The results show that more water is consumed with high protein diets, but that moisture content of droppings does not vary with protein content of feed. Excess moisture in litter is probably due to greater amt. of droppings

being voided on high protein rations.—*Lawrence Morris.* (Biological Abstracts)

JOHNSON, W., and REGINA FORGE. SOYBEANS AS GREEN FODDER FOR POULTRY. *Agric. Gaz. N. S. Wales 60:* 663-664. 1949. —An expt. undertaken at the Poultry Expt. Sta. Farm, Seven Hills, New S. Wales, has indicated that soybean is a very useful summer green feed crop. It is, however, somewhat slow maturing and does not make 2d growth after cutting.—*A. J. Loustalot.* (Biological Abstracts)

JUKES, T. H., E. L. R. STOKSTAD, and H. P. BROQUIST. *(Amer. Cyanamid Co., Pearl River, N. Y.)* EFFECT OF VITAMIN B_{12} ON THE RESPONSE TO HOMOCYSTINE IN CHICKS. *Arch. Biochem. 25:* 453-455. 1950.—Vit. B_{12}-deficient chicks were fed a diet deficient in methionine and B_{12} and the effects of various supplements were studied. Homocystine, with or without betaine, did not promote growth. However, the chicks responded to the addition of methionine. When supplemented with B_{12} the chicks responded to methionine, homocystine, or homocystine plus betaine. Growth was more rapid on methionine plus B_{12} than on methionine alone.—*George Kalnitsky.* (Biological Abstracts)

JUKES, T. H. FEED INGREDIENTS AND THEIR NEED *Flour & Feed, 50(6):* 14, November, 1949.—It has been shown that certain animal protein factor supplements contain in addition to vitamin B_{12} a second growth-promoting factor, which is needed by chicks and especially by turkeys on all-vegetable diets.

The requirement of chicks for the AP factor is markedly increased by raising the protein level of the basal diet.

The existence of this phenomenon prevents a statement of microbiological assay values of protein concentrates in terms of animal protein factor. For example, a batch of soybean meal might be found to contain 5 millimicrograms of B_{12} per gram by microbiological assay. The presence of vitamin B_{12} would indicate animal protein factor activity, but the same sample of soybean meal, if added to a chick starter mash, would increase the requirement of the chick for animal protein factor. Therefore, it would appear to have a negative value in the chick assay. This point illustrates one of the difficulties in applying microbiological assays to poultry nutrition.

There is a marked carryover of the AP factor from the hen through the egg yolk to the newly hatched chick and the parent hen may ingest the factor either from the laying mash or from fermented litter on the floor of the hen house.

A derivative of vitamin B_{12} has been isolated, "vitamin B12a," which is far more active in the L. lactic Dorner assay than in the chick assay. (Experiment Station Record)

KENNARD, D. C. *(Ohio Agric. Expt. Sta., Wooster.)* FLOOR LITTER MANAGEMENT AS A FACTOR IN POULTRY NUTRITION. *Feedstuffs [Minneapolis] 22(9):* 30-34. 1950.—Floor litter management has changed from the older practice of frequent removal and replacement of litter to one of allowing litter to accumulate to form "built-up litter." Work at the Ohio Agric. Expt. Station demonstrated that hens which received a deficient ration on old built-up litter produced eggs of good hatchability, but hens fed the same ration and kept in houses where the litter was removed and renewed each two weeks produced eggs which were poor in hatchability, demonstrating that dietary requirements of hens depended upon the management of the floor litter. Hens were fed deficient diets supplemented with alfalfa meal, dried whey, and meat scraps. In no case were eggs of high hatchability produced when the floor litter was removed and replaced regularly, but when built-up litter was used, good hatchability resulted in all cases except where alfalfa meal was the sole supplement. Deficiencies of riboflavin and animal protein factors were suggested for the fresh litter pens, but this was corrected by the use of built-up litter. These expts. have been carried through the starting and growing periods, and through subsequent pro-

duction with pullets with similar results. In each case the performance in rate of growth, egg production, or hatchability has been improved by the use of built-up litter.—*H. L. Wilcke.* (Biological Abstracts)

KING, ROBERT H., and S. M. HAUGE. *(Purdue U. Agric. Expt. Sta., Lafayette, Ind.)* CONCENTRATION OF THE UNIDENTIFIED GROWTH FACTOR IN CONDENSED FISH SOLUBLES. *Arch. Biochem. 24:* 350-358. 1949.—Condensed fish solubles contain an unidentified rat growth factor distinct from the chemically defined vits. and amino acids and from the vit. B_{12} and unidentified growth substances in distillers' dried solubles. It is soluble in water, in ethanol, and in mixtures of acetone, ethanol, and water, insoluble in ether and chloroform, not adsorbed by fuller's earth, readily adsorbed by and eluted from Florisil, and not precipitated by lead. Extraction of condensed fish solubles with ethanol permitted the removal of 90% solids without appreciable loss of activity. Further concn. was affected by extraction with ether and with chloroform and by precipitation with lead. The activity remained in the water soln. Subsequent adsorption on Florisil, followed by elution with 80% ethanol, yielded a concentrate which was biologically active at 2 p.p.m. in the test diet. The factor is probably responsible for the growth-stimulating effect of condensed fish solubles upon rats and chicks. —*S. M. Hauge.* (Biological Abstracts)

KRATZER, F. H. LINSEED OIL MEAL WATER-TREATED OR SUPPLEMENTED WITH PYRIDOXINE SATISFACTORY FOR POULTS. *California Agriculture, 4(8):* 10, August 1950.—

Poults fed the ration containing 30% of the untreated linseed oil meal grew slowly and three out of nine birds died. Before one poult died, it underwent a convulsion similar to that observed in poults fed a pyridoxine deficient ration.

When pyridoxine was added to the ration, growth was markedly improved.

Growth of the poults fed the water-treated linseed oil meal was also equivalent to that of the group receiving the pyridoxine supplementation. Addition of pyridoxine to this ration gave no additional response. (Experiment Station Record)

KRATZER, F. H., D. E. WILLIAMS, and BLANCHE MARSHALL. *(U. California, Davis.)* THE RELATION OF LYSINE AND PROTEIN LEVEL IN THE RATION TO THE DEVELOPMENT OF FEATHER PIGMENT IN TURKEY POULTS. *Poultry Sci. 29:* 285-292. Illus. 1950.—When lysine-deficient rations were fed to poults, the feathers which were developing showed an absence of pigment after approx. 2 weeks. The same length of time was required for normal pigment to show in the feathers when poults were switched to an adequate ration. The level of lysine required to prevent the pigmentation failure increased when the protein content was increased from approx. 10 to 35% of the ration. The lysine requirement may not be expressed accurately as % of total protein. Deficiencies of arginine and the sulfur-containing amino acids did not cause the pigmentation failure.—*F. H. Kratzer.* (Biological Abstracts)

LEPKOVSKY, S., W. SHAELEFF, D. PETERSON, and R. PERRY. *(U. California, Davis.)* ALFALFA INHIBITOR IN CHICK RATIONS. *Poultry Sci. 29:* 208-213. 1950.—Several methods of dehydrating alfalfa meal were compared to determine if methods of prepn. were a factor. All tests were negative, but the inhibitor factor was removed by use of hot water as an extracting agent. Dehydrated alfalfa meal does contain a factor (or factors) which definitely inhibits growth when fed at a level of over 5% in the mash ration. The factor (or factors) was influenced very little, if any, by storage conditions. The addition of B complex vits. did not counteract the efforts of the depressing factor. Fiber in the ration was not the cause of the lowered growth.—*Lawrence Morris.* (Biological Abstracts)

LILLIE, ROBERT J., G. F. COMBS, and G. M. BRIGGS. *(U. Maryland, College Park.)* FOLIC ACID IN POULTRY NUTRITION. I. THE CRITICAL NEED FOR FOLIC ACID BY LAYING PULLETS. *Poultry Sci. 29:* 115-121. 1950.—New Hampshire pullets housed in batteries were fed practical rations containing varying amts. of folic acid during a 4.5- and 11-month period. Addition of folic acid to a practical ration which contained 26 μg. of folic acid per 100 g. resulted in improved hatchability and body wt. maintenance. Fertility was not affected and the differences in egg production were not consistent. A practical ration which contained 34 μg. of folic acid per 100 g. was adequate for the maintenance of normal egg production, fertility, hatchability, and body wt. Addition of folic acid to this ration, however, resulted in a slight increase in the Hb levels and the folic acid content of the egg yolks. No apparent differences were noted in down color, size, and wt. of progeny as a result of the low folic acid maternal diets. The minimum folic acid requirement of New Hampshire pullets for normal hatchability appears to lie between 26 and 34 μg. per 100 g. of ration.—*G. F. Combs.* (Biological Abstracts)

LILLIE, ROBERT J., G. F. COMBS, and G. M. BRIGGS. *(U. Maryland, College Park.)* FOLIC ACID IN POULTRY NUTRITION. II. EFFECT OF MATERNAL DIET AND CHICK DIET UPON MORTALITY, GROWTH, AND FEATHERING OF PROGENY. *Poultry Sci. 29:* 122-129. Illus. 1950.—The progeny of New Hampshire pullets fed a folic acid-low practical ration showed poor growth, poor feather structure, abnormal feather pigmentation and greater mortality as compared with the progeny of pullets fed rations adequate in folic acid, irrespective of the chick diet. A greater incidence of abnormal feather pigmentation and poor feather structure was observed among the males than among the females of progeny from pullets fed the folic acid-low ration, indicating a sex difference. Normal chicks grew somewhat less rapidly and exhibited a greater incidence of abnormal feather pigmentation at 6 weeks of age when fed a folic acid-low ration during the first 2 weeks followed by a folic acid supplemented ration, than when fed the supplemented ration during the entire period. The possible occurrence of folic acid deficiencies under practical conditions is discussed.—*G. F. Combs.* (Biological Abstracts)

LILLIE, ROBERT J., M. W. OLSEN, and H. R. BIRD. *(U. S. Dept. Agric., Beltsville, Md.)* ROLE OF VITAMIN B_{12} IN REPRODUCTION OF POULTRY. *Proc. Soc. Exptl. Biol. and Med. 72:* 598-602. 1949.—When hatching eggs laid by R. I. Red hens fed a diet deficient in vit. B_{12} were injd. with crystalline vit. B_{12}, the hatchability was improved. Among the chicks hatched from vit. B_{12}-injd. eggs, the growth rate was greater, the mortality lower and the feathering better than among chicks hatched from H_2O-injected and non-injd. eggs.—*R. J. Lillie.* (Biological Abstracts)

LLOYD, JOHN T., and MORTIMER BYE. INDUCING YOUNG POULTRY, ESPECIALLY TURKEYS, TO EAT. *U. S. Patent 2,464,704;* Appln. June 13, 1945; Issd. March 8, 1949.—A bed of finely divided mash feed contains many larger particles of an edible stimulator of a color contrasting with the mash feed. The stimulator should be bright in color, pea-sized and capable of breaking up readily. (Biological Abstracts)

MARCH, B. E., D. STUPICH, and JACOB BIELY. *(U. British Columbia, Vancouver, Canada.)* THE EVALUATION OF THE NUTRITIONAL VALUE OF FISH MEALS AND MEAT MEALS. *Poultry Sci. 28:* 718-724. 1949.—Four feeding tests were carried out with 8 fish and meat meals used as protein supplements for corn and wheat basal rations. The protein index values were determined by Almquist's method. The meals were also assayed for amino acids. By all methods considerable variation in the nutritive values of the meals were found. The supplementary feeding values were much the same regardless of whether corn or wheat was the principal grain in the basal ration. None of the amino acids studied gave a satisfactory correlation with the growth responses of the chicks, but the available tryptophan, methionine, and cystine con-

tents did show some relationship to growth. A correlation was found between available methionine plus cystine and the digestible protein N and chick growth. A linear correlation was established between available tryptophan and digestible protein N and chick growth. It is suggested that an amino acid analysis on acid hydrolysis of the total protein corrected for the indigestible and the non-protein fractions would indicate the biological value of animal protein concentrates. (Biological Abstracts)

MITCHELL, H. H., T. S. HAMILTON, and JESSIE R. BEADLES. THE NUTRITIONAL EFFECTS OF HEAT ON FOOD PROTEINS, WITH PARTICULAR REFERENCE TO COMMERCIAL PROCESSING AND HOME COOKING. *Journal of Nutrition*, 39; 413.—1949.

The samples compared were unheated, or very mildly heated as in a solvent-extraction method, and heated to high temperatures by autoclaving in the laboratory (sunflower seed meal), subjection to oil extraction by the expeller process (peanut and linseed meals) or the hydraulic process (cottonseed flour), or subjection to a process of flaking and toasting (corn).

During these heating processes the digestibility of the proteins of sunflower seed meal, cottonseed flour and corn was definitely decreased by amounts ranging from 2.5 to 14.2 percentage units. The biological value of the proteins of peanut meal, sunflower seed meal, and cottonseed flour was also definitely decreased in these processes. (Experiment Station Record)

NICHOL, C. A., L. S. DIETRICH, C. A. ELVEHJEM, and E. B. HART. *(U. Wisconsin Coll. Agric., Madison.)* OBSERVATIONS ON FOLIC ACID DEFICIENCY IN THE CHICK IN THE PRESENCE OF VITAMIN B_{12}. *Jour. Nutrition 39:* 287-298. Illus. 1949.—Folic acid deficiency in chicks fed a sucrose-casein purified ration was accentuated by injecting vit. B_{12} solns. of crystalline or adding it to the ration. Extended quivering wings, body tremors and complete paralysis developed in over half of the chicks given the vit., but not in the control group. Treatment with folic acid caused complete disappearance of these symptoms within 24 hrs. Injn. was more effective than oral admn. Vit. B_{12} increased the rate of growth of the folic acid-deficient chicks but did not cause marked improvement in feathering. When added to a sucrose-casein purified ration containing folic acid, it caused a further significant increase in growth. The relation of folic acid and vit. B_{12} to vits. B_c and B_{11} is briefly discussed.—*Auth. (courtesy Wistar Bibl. Serv.)*

PETERSON, D. W. ALFALFA IN CHICK RATIONS; POSSIBLE CONTROL OF GROWTH DEPRESSING EFFECT OF ALFALFA INDICATED BY ADDITION OF CHOLESTEROL TO DIET OF CHICKS. *California Agriculture 4:* 13. 1950.—

Evidence obtained in feeding tests indicates that the depressing effect of dehydrated alfalfa on the growth of chicks can be counteracted largely by the inclusion of cholesterol—a type of crystalline alcohol—in alfalfa-containing rations.

It appears that the growth depressing effect is due to a naturally occurring substance which in some unknown manner produces a toxic effect on chicks.

The deleterious effect of alfalfa meal is present in the fresh alfalfa—as determined by drying fresh frozen alfalfa and feeding it—but it is not due to the fiber present, nor to the mineral constituents.

Most of the inhibitory effect on growth can be removed by exhaustive extraction of the alfalfa meal with hot water. The residue so produced has little growth-depressing action, whereas the water extract produces marked inhibition of growth.

It appears probable that the growth depression is due to saponins, since all fractions producing growth depression had a hemolytic action which was prevented by cholesterol. It cannot be stated without qualification, however, that saponins are responsible for the growth inhibiting properties of alfalfa meal until they are isolated in pure form from alfalfa and shown by feeding tests to cause growth depression. (Experiment Station Record)

PETERSEN, CHARLIE F. *(U. Idaho Agric. Expt. Sta., Moscow.)* SUPPLYING APF IN POULTRY RATIONS. *Feedstuffs [Minneapolis] 22(10):* 22-23. 1950.—A comparison was made of herring fish meal, whole carcass or rendering plant meat meal, and packing plant meat meal as sources of essential factors for hatchability, chick quality, and carry-over in the chick. All 3 produced good hatchability (88, 93, and 89% respectively) but the percentage of good chicks was only 65 on the packing plant meat meal as compared with 74 and 75% on the other 2 supplements. Only the herring meal transferred enough of the factors to promote rapid growth in chicks to 4 weeks of age when fed rations containing no known source of A.P.F. Herring meal was effective when fed at a 1% level, and it produced good hatchability at a 0.5% level. When pea meal was used as a protein supplement, hatchability was 68%, indicating that the A.P.F. was picked up from the litter. Better growth was obtained with chicks when herring fish meal was used than when exptl. A.P.F. supplements were used. The complete removal of animal proteins from chicken or turkey starting or breeder rations is not advised.—*H. L. Wilcke.* (Biological Abstracts)

RICHARDSON, L. R., and L. G. BLAYLOCK. *(Texas Agric. Expt. Sta., College Station.)* VITAMIN B_{12} AND AMINO ACIDS AS SUPPLEMENTS TO SOYBEAN OIL MEAL AND COTTONSEED MEAL FOR GROWING CHICKS. *Jour. Nutrition 40:* 169-176. 1950.—Chicks receiving either a milo soybean oil meal or a cerelose soybean oil meal diet grew at a subnormal rate. Supplementing either diet with 5 g. of a charcoal adsorbate of vit. B_{12} produced an increase in the growth rate equal to that obtained by supplementing the diet with 5% of sardine meal. One g. of the adsorbate was sufficient with the milo diet but was inadequate with the cerelose diet. A commercial cottonseed meal whose gossypol content ranged from 0.033 to 0.04% supported as rapid a rate of growth when supplemented with vit. B_{12} and 0.2% of L-lysine as soybean oil meal. Methionine and tryptophan in addition to lysine did not increase the growth rate. When the cottonseed meal was supplemented with lysine and vit. B_{12} was omitted the chicks grew at a subnormal rate. Chicks receiving a cerelose diet that contained 20% of soybean oil meal and 30% of cottonseed meal and was supplemented with vit. B_{12} grew as rapidly as those receiving a similar diet with all the protein supplied by soybean oil meal. Without vit. B_{12} the chicks grew at a subnormal rate. These data suggest that plant proteins of relatively low value may be used as a source of protein for growing chicks by supplementing them with soybean oil meal and vit. B_{12}.—*Auth. (courtesy Wistar Bibl. Serv.).*

SCHAEFFER, A. E., W. D. SALMON, D. R. STRENGTH, and D. H. COPELAND. *(Alabama Polytech. Inst., Auburn.)* INTERRELATIONSHIP OF FOLACIN, VITAMIN B_{12} and CHOLINE. *Jour. Nutrition 40:* 95-111. 1950.—The nutritional requirements of the chick and and rat for folacin, vit. B_{12} and choline are interrelated, and a specific requirement for one of these nutrients cannot be established unless the level of the other 2 is taken into consideration. Weanling rats (AES strain) and day-old Leghorn chicks were fed diets, low in choline and methionine, which were composed of extracted peanut meal 30, extracted casein 6,L-cystine 0.1, cod liver oil 1, lard 19, sucrose, salts and synthetic vitamins. In weanling rats fed the basal diet supplemented with 0.04% choline chloride there was 100% incidence of renal hemorrhage. Supplementing this diet with folacin significantly decreased the incidence and severity of renal damage. When both folacin and vit. B_{12} were added to the diet contaiaing 0.04% choline chloride, there was complete protection against kidney damage. Both folacin and vit. B_{12} were required for max. chick growth. When both were present in the diet, the resulting gain was an additive effect and the choline requirement was greatly reduced. Slightly higher hemoglobin levels were consistently observed when both nutrients were present in the diet. Both folacin and vit. B_{12} in addition to choline and manganese, were concerned in the prevention of perosis in the chick. For normal feathering, liver weight to

body weight ratio and gall bladder size both folacin and vit. B_{12} appeared to be essential.—*Auth. (courtesy Wistar Bibl. Serv.).*

SMITH, S. B., and W. H. WILEY. ARE PELLETED MILK BY-PRODUCTS WORTHWHILE? *Research for the Farmer*, June, 1950, *62nd Annual Report Rhode Island Agr. Exp. Sta.* page 11.—Two tests were run with Rhode Island Red pullets. One group was fed the pelleted milk by-products in addition to a good standard laying ration. The other group received the laying ration alone. After 6 months, the groups were reversed to try and eliminate pen variability. Records of production, hatchability and economy were taken and compared.

Hatchability of chickens getting the pellets seemed to increase over the other group, but production remained about the same. Cost of production was not lowered in the group receiving the by-products. Smith and Wiley feel that this cost might be reduced under other conditions. (Experiment Station Record)

SMYTH, J. R., R. W. GERRY, and C. E. HOWES. DEHYDRATED POTATOES AS A SUBSTITUTE FOR CORN IN A CHICK RATION. *Research for Maine Farmers, 65th An. Rept. of Progress*, Year Ending June 30, 1949, Bulletin 473, page 66.—Dehydrated potatoes were used to replace 25, 50, 75, and 100 percent of the corn in a standard starting ration fed in two tests to 225 Rhode Island Red chicks. The starting ration containing 40 percent of corn was used as a check. The results of the two tests show that the type of dehydrated potato used was not satisfactory as a substitute for corn especially when 50 percent or more of the corn was replaced. (Experiment Station Record)

SUNDE, M. L., W. W. CRAVENS, C. A. ELVEHJEM, and J. G. HALPIN. *(U. Wisconsin, Madison.)* THE EFFECT OF DIET AND CECECTOMY ON THE INTESTINAL SYNTHESIS OF BIOTIN IN MATURE FOWL. *Poultry Sci. 29:* 10-14. 1950.—Normal and cecectomized birds were fed biotin-deficient rations containing sucrose or dextrin as the carbohydrate. Similar diets containing biotin were also fed to normal and cecectomized birds. The results indicate that the depletion period was prolonged with cecectomy and that the hatchability and biotin content of the eggs was somewhat higher from the cecectomized birds. A possible explanation of these results is presented.—*Authors.* (Biological Abstracts)

SUNDE, M. L., W. W. CRAVENS, H. W. BRUINS, C. A. ELVEHJEM, and J. G. HALPIN. *(U. Wisconsin, Madison.)* THE PTEROYLGLUTAMIC ACID REQUIREMENT OF LAYING AND BREEDING HENS. *Poultry Sci. 29:* 220-226. 1950.—Single Comb White Leghorn hens were fed a low pteroylglutamic acid (P.G.A.) ration which contained sucrose as the carbohydrate. 8 levels of P.G.A. were fed and the results indicate that about 0.25 mg. of P.G.A. per kg. of ration is required for body wt. maintenance, and slightly more for satisfactory egg production. About 0.5 mg. of P.G.A./kg. of ration is required for good hatchability, but about 1 mg./kg. is necessary for storage of a significant amt. of P.G.A. in the day-old chick and for good livability of chicks fed a deficient diet. Symptoms of pteroylglutamic acid deficiency in chick embryos are briefly described.—*Authors.* (Biological Abstracts)

SUNDE, M. L., W. W. CRAVENS, C. A. ELVEHJEM, and J. G. HALPIN. *(U. Wisconsin, Madison.)* AN UNIDENTIFIED FACTOR REQUIRED BY CHICKS FED PRACTICAL RATIONS. *Poultry Sci. 29:* 204-207. 1950.—11 expts. have been conducted comparing vitamin B_{12} with fish solubles and liver products and in each case the chicks fed the fish solubles or liver have been larger at the end of the test period than those in the groups receiving crystalline B_{12} or the B_{12} concentrate. It is suggested, therefore, that chicks fed all vegetable rations require a factor or factors in addition to vitamin B_{12} and other known vitamins for maximum growth. The relation between the factor indicated from these data and other postulated unidentified factors cannot be detd. at this time.—*Authors. (Biological Abstracts)*

SUNDE, M. L., and W. W. CRAVENS. *(U. Wisconsin, Madison.)* USE OF DRIED WHEY IN RATIONS OF LAYING AND BREEDING HENS. *Feedstuffs [Minneapolis] 22(9):* 27-28. 1950.—About 10 billion pounds of whey are produced annually in the U. S., containing 50 million lbs. of protein, 11 million lbs. of phosphorus (P_2O_5), 7 million lbs. of calcium (CaO), and 12 thousand lbs. of riboflavin. Pullets were fed basal diets made up of ground yellow corn (35), wheat bran (15), wheat middlings 15), alfalfa leaf meal (5,) meat scrap (4), soybean oil meal (12), corn gluten meal 5, granite grit (2), limestone grit (2), bone meal (2), iodized salt (1), fish oil 85D (2), manganese sulfate (20 g. per 100 lbs. mash). Addition of dried whey to this diet at the rate of 5% showed an improvement in hatchability of fertile eggs from 70 to 81% on the basal diet to 87 to 88% on the supplemented diets. There was no appreciable effect upon egg production in the 1st yr. The lower production in the group fed the basal diet in the second year is attributed to a slump in production of that group during cold weather.—*H. L. Wilcke.* (Biological Abstracts)

SPITZER, R. R. THE NEED FOR B VITAMINS IN FEEDS. *Proceedings First Nutrition School for Feed Men, University of Wisconsin, Madison.* August 28-29, 1950, page 21.—At least sixteen or more vitamins are required by animals. Eleven of these are referred to as B vitamins.

The B vitamins are an "accidental" collection of eleven or more substances grouped together because they were first found in common sources, yeast and liver. Actually, each of the vitamins is distinct from the others and has a special job.

Of the eleven B vitamins required by livestock and poultry, vitamin B_1, B_6, inositol, folic acid, biotin, and para-amino-benzoic acid are supplied in adequate amounts under most conditions by farm feeds. The remaining five, vitamin B_2, choline, niacin, B_{12}, and pantothenic acid are critical when ordinary farm rations are fed.

Riboflavin—Riboflavin deficiency results in wasted feed, poor growth, curled toes, and paralysis and poor hatchability in poultry.

Niacin—Wasted feed, poor growth, skin changes, and forms of "necro" result when niacin is short. In poultry, poor feathering, poor hatchability, and perosis are symptoms of the deficiency.

Pantothenic acid—Swine suffering from a shortage of pantothenic acid waste feed, grow poorly, and walk with a stilted gait commonly called "goose stepping." Poultry waste feed, grow poorly, and have skin disorders.

Choline—Choline is needed to prevent certain liver troubles, slipped tendon, and to allow top growth in poultry. It is needed in swine for good reproduction, good growth, and to prevent leg troubles.

Vitamin B_{12}—Deficiencies of this vitamin result in wasted feed and poor growth, and in the case of poultry, poor hatchability.

Unknown B vitamins—Supplied by certain milk, meat, fish, fermentation and alfalfa products; have been reported essential for health, top growth, and good reproduction.

B vitamin deficiencies can be prevented by including ample quantities of vitamin-rich ingredients in rations of swine and poultry. Quality ingredients include selected fish meal, fish solubles, milk products, quality liver products, brewers' yeast, distillers' and fermentation solubles, alfalfa meal, good pasture, meat scraps, tankage, animal protein factor supplements, and "pure" vitamins in suitable carriers. (Experiment Station Record)

STADELMAN, W. J., R. V. BOUCHER, and E. W. CALLENBACH. *(Pennsylvania Agric. Expt. Sta., State College.)* THE EFFECT OF VITAMIN D IN THE TURKEY BREEDER RATION ON EGG PRODUCTION AND HATCHABILITY AND ON GROWTH AND CALCIFICATION OF THE POULTS. *Poultry Sci. 29:* 146-152. 1950.—9 groups of 14 turkey pullets each were supplemented with vit. D either from bluefin tuna liver oil or irradiated 7-dehydrocholesterol at levels increasing from 908 to 8240 A.O.A.C. chick units per lb. of diet. During

the 63-day exptl. period, egg production was not affected but hatchability was depressed in the negative control group. In expts. using the 1582 pedigreed poults that were hatched it was found that the vit. D intake of the dam influenced both wt. and calcification of the progeny when they received less than 306 A.O.A.C. chick units of vit. D per lb. of diet.—*Authors.* (Biological Abstracts)

TEMPERTON, H., and F. J. DUDLEY. *(Nation. Inst. Poultry Husbandry, Shropshire, Eng.)* THE BIOLOGICAL ACTIVITY OF THE XANTHOPHYLLS OF GRASS IN METABOLISM. II. THE INTERACTION OF BETA-CAROTENE, LUTEIN AND ALPHA-TOCOPHEROL. *Harper Adams Utility Poultry Jour. 34:* 37-49. 1949.—A basal starting diet low in carotenoids and containing no provitamin A was supplemented with beta-carotene, a carotene-free xanthophyll extract of dried grass and alpha-tocopherol, singly or in combination. Two hatches of chicks were used from 4 lots of parents fed a basal diet low in carotenoids to which 5% of dried grass meal was included for 3 lots. Vit. E in the starting diet delayed but did not prevent death through avitaminosis-A to 8 wks. of age. Vit. E apparently induced a more efficient utilization of initial vit. A. A carotene-free xanthophyll extract of dried grass in the basal starting diet led to a greater survival rate and a higher avg. body wt. at 4 wks. compared with the unsupplemented basal diet.—*T. B. Clark.* (Biological Abstracts)

TODD, A. C., M. F. HANSEN, G. W. KELLEY, Z. N. WYANT, and T. G. CULTON. *(Kentucky Agric Exptl. Sta., Lexington.)* DIET OF HENS AND RESISTANCE OF THEIR OFFSPRING TO HELMINTHIC INFECTION. *Poultry Sci. 29:* 264-267. 1950.—The amt. of wt. gained in a 3-week test period by 566 New Hampshire chicks hatched from eggs produced by 6 groups of hens on different diets, following exposure to infective eggs of the intestinal nematode of chickens, *Ascaridia galli*, was detd. in order to establish degrees of resistance to effects of parasitism. Significant differences in amts. of wt. gained were found in chicks hatched from eggs produced by hens on varying diets even when the exptl. chicks were all fed the same diet.—*Authors.* (Biological Abstracts)

CORN GLUTEN MEAL VERSUS SOYBEAN MEAL IN ANIMAL PROTEIN FACTOR STUDIES IN LAYING HENS. *Results of Research in 1949 by the Kentucky Agr. Expt. Sta. 62nd Annual Report.* page 39.—The corn gluten meal basal diet did not support as high a rate of production, egg size, or hatchability as that maintained by the soybean meal basal diet. Supplementation of the corn gluten meal with fish meal significantly increased the rate of production, egg size, and percent hatch of fertile eggs. Supplementation with vitamin B_{12} increased hatchability but did not improve production nor egg size. (Experiment Station Record)

FIBER IN CHICK STARTING RATIONS. *Results of Research in 1949 by the Kentucky Agr. Expt. Sta. 62nd Annual Report.* page 39.—Maximum growth was obtained on rations containing approximately 5 percent or less fiber from any source. Comparisons between experiments indicate great differences in the growth-promoting properties of different samples of alfalfa meal. These differences can probably be attributed to factors other than the fiber content. (Experiment Station Record)

GOOD RATIONS MAY LOWER INCIDENCE OF PULLORUM DISEASE. *Progress in Solving Farm Problems of Illinois. Report for 1947-48.* page 60.—Previous studies have shown that chicks fed rations containing high levels of alfalfa meal are less likely to survive an infection of pullorum disease than are chicks fed a normal ration. The difference is presumably associated with the fiber content of the ration and the related level of productive energy. To find out whether other nutrients may also be involved, a ration previously shown to result in

exceptionally rapid growth and believed to be adequate in all nutrients (Ration X) was compared with four other rations fed to both inoculated and non-inoculated New Hampshire chicks.

The growth-promoting ability of Ration X proved to be far superior to that of the other rations tested. Gain in weight per unit of feed consumed (feed efficiency) was likewise superior, and the survival rate of inoculated chicks exceeded by a substantial margin that of chicks fed the other rations. (Experiment Station Record)

SOME VITAMIN NEEDS OF POULTRY SATISFIED BY GRAIN. *Wisconsin Annual Report, part two, What's New in Farm Science, Bulletin 489,* December 1949, page 73.—Poultrymen won't have to worry about shortages of at least two vitamins in their laying and breeding flocks. They are biotin and pteroylglutamic acid. Both are necessary for laying hens and chicks, but both are supplied by any good practical laying ration.

Even if pteroylglutamic acid is not present in their feed, hens may do quite well if the ration contains dextrin as a carbohydrate source. Apparently dextrin favors the "manufacture" of the vitamin in the digestive tracts of mature hens.

A ration for breeding hens should contain about half to one part in a million, by weight, of pteroylglutamic acid according to indications to date. (Experiment Station Record)

TURKEYS AND VITAMIN B_{12}. *Research for the Farmer, June 1950, 62nd Annual Report Rhode Island Agr. Exp. Sta.* page 12.—S. B. Smith's work indicates that turkeys either have a low requirement for the vitamin or else the hen stores large amounts in the egg. The eggs were incubated for 11 days and then various amounts of the vitamin were injected into the allantoic cavity which surrounds the embryo. Complete records were taken on the birds as soon as they hatched but no consistent differences were found. (Experiment Station Record)

PATHOLOGY

BIERER, BERT W. LEUCOCYTOZOON INFECTION IN TURKEYS. *Veterinary Medicine, February, 1950,* page 87.—Leucocytozoon infection in turkeys is probably far more prevalent than we realize. The disease easily can be mistaken for fowl typhoid, fowl cholera, non-specific enteritis, or even respiratory infection, if symptoms and post-mortal lesions are considered alone. Here is a disease that can destroy up to 15% or higher of a partly grown turkey flock within a period of two or three weeks.

The disease is spread by species of gnats (Simulium), commonly referred to as black flies and more specifically as turkey gnats or buffalo gnats. The black flies act as vectors of the disease, within which the Leucocytozoon develops to sexual maturity. The Leucocytozoon cannot develop to sexual maturity in the turkey. The disease cannot spread directly from turkey to turkey. (Experiment Station Record)

BIERER, B. W. NAVEL INFECTION. How to recognize and how to prevent. This may be a reason why you get complaints and satisfied customers from same hatch. *Hatchery and Feed,* December, 1949, 23(12): 14.—There are two forms of navel infection or omphalitis. A mushy chick form and a less severe or dry form. The mushy form results from a severe infection that rapidly spreads to all parts of the body, resulting in a very weak or dead chick that is literally more or less mushy. All hatcherymen are familiar with this and with the peculiar odor produced by the presence of such chicks or poults in their trays.

The more elusive, less severe, or dry form can exist in hatches of good hatchability. The chicks or poultry look good at first but livability is poor. A few may be dead in the shipping crates when they arrive at

their destination and deaths continue up to a peak at six days and then decline until the tenth day, when mortality usually ceases.

Navel infection or omphalitis may be controlled by increasing the amount of fumigant two to two and one-half times the ordinary amounts of 17.5 to 20 grams of potassium permanganate and 35 to 40 cubic centimeters of formaldehyde, per 100 cubic feet of incubator space—to be used when the eggs have been transferred to the hatcher—when the temperature and humidity have been brought up to their proper peaks and before the eggs have begun to hatch. The ports should be open to assure rapid and even distribution of the fumigant. (Experiment Station Record)

BUENO, R. C. *(Inst. Biol., Sao Paulo.)* O CANIBALISMO: VICIO COMUM ENTRE AS AVES. [CANNIBALISM: COMMON VICE AMONG BIRDS.] *Biologico [Sao Paulo] 15:* 173-176. 1949.—Cannibalism is a serious problem for poultrymen. Most important causes include inadequate or deficient rations, crowding of the birds, excessive heat or light, moulting, and ectoparasites. Suggestions for proper feeding, space, and other points in prevention of cannibalism are given. Feather-picking may be reduced if 0.5 to 2% salt is fed for several days.—*J. L. Cartledge.* (Biological Abstracts)

COOPER, J. B., C. L. MORGAN, J. C. JONES, and G. W. ANDERSON. SULFAMERAZINE NO SUBSTITUTE FOR BLOOD TESTING TO CONTROL PULLORUM. *Sixty-First Annual Report of South Carolina Agr. Exp. Sta., Clemson, S. C.* May, 1950, page 55.—While sulfamerazine has been found to reduce mortality in young chicks infested with pullorum disease, its use with carrier hens as a means of preventing transmission of the disease to the chick through the egg, as in these trials, was unsuccessful. The rapid whole blood test should be used to detect positive pullorum reactors and such birds eliminated from poultry breeding flocks. (Experiment Station Record)

DUX, JAMES P., and CHARLES ROSENBLUM. *(Merck and Co., Inc., Rahway, N. J.)* SPECTROPHOTOMETRIC DETERMINATION OF SULFAQUINOXALINE. ITS APPLICATION TO POULTRY FEEDS AND FEEDS PREMIXES. *Analyt. Chem. 21:* 1524-1527. 1949. —The suitability of the Bratton-Marshal color reaction as the basis of spectrophotometric assay of sulfaquinoxaline was investigated using N-(1-naphthyl)-ethylenediamine dihydrochloride as the coupling agent. Because of nonlinear relationship between concn. and color intensity is obtained in the adopted procedure, extinction coeffs. were detd. at several concns. The effects of acidity and salt concns. on the color intensity were also investigated, and optimum conditions for color formation recommended. The method was applied to sulfaquinoxaline samples of known purity, to certain of its salts, to mixtures with inorganic diluents, and to medicated poultry feeds and feed premixes. In the use of the feed mixtures convenient sample sizes and dilution schedules are suggested for handling mixtures containing up to 15% sulfaquinoxaline.—*Auth. abst.* (Biological Abstracts)

FOSTER, A. O. NEW DRUGS IN COCCIDIOSIS. *Veterinary Medicine, XLV;* 44, 1950.—Marked developments in the chemical control of coccidiosis, particularly of poultry, appear likely in the near future. During recent years the sulfonamides, notably sulfamethazine, sulfaguanidine, sulfamerazine, and sulfaquinoxaline, have been popular. These are the first drugs, after elemental sulfur, that exhibited a satisfactory combination of efficacy and safety against this type of disease in domestic animals and poultry. During recent years, much work has been done with atabrine (mepacrine), notably in foreign countries, and the results leave little doubt of the activity and promise of this antimalarial drug. Nitrofurazone has also been described as effective and safe, and is now being marketed. At a conference on coccidiosis, held last March under the auspices of the New York Academy of Sciences, reports were given on the use and practical promise of nitrophenide,

nitrofurazone, and certain bis-phenol derivatives. These and other facts suggest a trend toward drugs that are quite different from, and presumably superior to, the sulfonamides for the control of coccidiosis in poultry. (Experiment Station Record)

GENEROSO, J. D., and I. L. MENDOZA. *(Bureau of Animal Industry, Manila, Philippines.)* OBSERVATIONS ON THE USE OF THE MUKTESWAR STRAIN OF VIRUS AS VACCINE AGAINST AVIAN PEST IN THE PHILIPPINES. *Philippine Journal of Animal Industry 10:* 163-179. 1949.—The Mukteswar strain of Newcastle disease virus after being filtered was passed in six 10-day old chicken embryos after about eight months storage in the refrigerator and found viable. The allantoic and amniotic fluids collected from the inoculated eggs were used as virus vaccine and in dilution of 1 to 1,000 and 1 to 500 in physiological saline when injected intramuscularly in 1 cc. and ½ cc. doses, respectively, did not cause any noticeable reaction or any untoward effect to inoculated chickens; and protected them against the challenged inoculation of 50,000 MLD of the local strain of virulent virus given one week after the vaccine injection. In 1 to 100 dilution, when two chickens were inoculated by the following routes: (1) one drop into one eye; (2) one drop into the cloaca; (3) wetting with the vaccine scarified comb; (4) wetting with the vaccine scarified skin; and 5) pricking the wing web with lancet wet with vaccine all the routes were found appropriate for protective inoculation. The pricking of the wing web is considered the most economical and practical method of inoculation for the field application of the vaccine. Mixing the vaccine with feeds with 30 minutes interval between the mixing and the feeding, the two chickens fed succumbed to the challenged inoculation. Virus vaccine diluted 1 to 100 and 1 to 500 failed to give protection after one week exposure to ordinary atmospheric temperature, but in 1 to 500 dilution and exposed for 72 hours the vaccine protected the inoculated chickens against the challenged inoculation of virulent virus. This dilution 1 to 500 still gave protection to chickens six months after they were inoculated either by intra-muscular injection of ½ cc., by wetting scarified skin, or by dropping one drop into one eye.

Field observation which lasted for a few months showed that in a total of 62,515 birds inoculated, 775 of which were already showing symptoms of Newcastle disease when vaccinated, 1.31 per cent died, 1.34 per cent developed paralysis, and 47.34 per cent recovered out of those inoculated when already sick and those that developed paralysis or other untoward effects. Further experimentation may eliminate its objectionable features of causing paralysis and reduction or suspension in egg laying.—*F. M. Fronda.*

HINSHAW, W. R. POULTRY PRACTICE PROBLEMS. *Veterinary Medicine, XLV:* 45, 1950.—According to Jungherr, Luginbul, and Kilham *(Science, 110:* 333, 1949), the presence of neutralizing antibodies in human blood serum is not positive proof that the person has had contact with the disease. They base this assumption on the fact that they have found a possible relationship of the virus of Newcastle disease (avian pneumoencephalitis) to the virus of mumps. In 22 mumps patients studied by them, 13 yielded blood samples with neutralizing indices of 250 or greater and ten of these had indices of over 1,000. In contrast, only three of 23 serums from control patients had indices over 250 and none were over 800. They suggest that diagnosis of Newcastle disease in man should be made with caution, especially in the absence of virus isolation. (Experiment Station Record)

HINSHAW, W. R. POULTRY PRACTICE PROBLEMS. *Veterinary Medicine, XLV:* 45, 1950.—No one recommendation can be made for the control of cannibalism. The first prerequisite to successful control is to find the cause if at all possible to do so. Nutrition, and even genetics must be considered. Sometimes a "boss" in the group may be responsible for starting others to develop the habit. Management factors which may be responsible include overcrowding, and insufficient waterers and

feeders. Debeaking by one of several methods is a preventive. (Experiment Station Record)

JUNGHERR, ERWIN L. *(U. Connecticut, Storrs.)* TEN YEAR INCIDENCE OF FIELD ENCEPHALOMALACIA IN CHICKS AND OBSERVATIONS ON ITS PATHOLOGY. *Ann. New York Acad. Sci. 52:* 104-112. 1949.—Based on the State diagnostic records, the incidence of field encephalomalacia in chicks since its first observation amounted to 31, 15 and 13 case lots for 1936 to 1938, as reported previously, and to 16, 32, 25, 23, 8, 15, 3, 23, 11 and 62 for 1939 to 1948, an average of 18 for the first 12 yrs., but almost 3.5 times the yearly avg. for 1948. The reasons for the yearly fluctuations are unknown and have been speculatively ascribed to "heated" corn. A new type of broiler ration with high energy, low fiber values containing 19% animal protein supplements, was used without marked increase of encephalomalacia in 1947, but with high incidence in 1948. Later modifications of the ration lowering animal protein and/or adding small amts. of wheat germ oil seemed to decrease the incidence. As a rule 2 specimens per consignment were examined histopathologically. In addition to the pathognomonic ischemic necrosis, primarily of the cerebellum, the disease was found to be characterized by fibrosis in the cerebellum, and vascular and adventitial proliferations in the extra-cerebellar portions of the brain. Occasionally lesions were seen in 1-week-old chicks suggestive of parentally transmitted deficiency and in 32-week-old chicks. Proved cases failed to exhibit histologic evidence of A-hypo-vitaminosis. In distinction from Adamstone's results, achromatic pinpoint areas in the brain were not found to be indicative of A-hypovitaminosis. Attention is called to the occurrence of clinically inapparent conditions resembling exptl. E-avitaminosis, viz., dystrophy of voluntary muscle in pheasants, similar to that in ducklings, and of involuntary ventricular muscle in chickens, similar to that in poults. The report brings out the relatively frequent occurrence and the broadened pathologic aspects of field encephalomalacia.—*E. L. Jungherr.* (Biological Abstracts)

LITTLE, PAUL A., ANGUS SAMPATH, V. PAGANELLI, E. LOCKE, and Y. SUBBAROW. THE EFFECT OF FOLIC ACID AND ITS ANTAGONISTS ON ROUS CHICKEN SARCOMA. *Trans. New York Acad. Sci. 10:* 91-98. 1948.—A flock of 300 New Hampshire Red chickens supplied in groups of 50 chickens 4-9 wks. old and baby chicks 1 day old were infected with Rous sarcoma virus and maintained on a synthetic folic acid-free diet from time of inoculation with virus. Rous chicken sarcoma was completely prevented by this diet but nearly all chicks developed tumors when injd. daily with folic acid. Rous sarcoma was also prevented by treating the chicks with antagonists of folic acid, 4-aminofolic acid, 4-aminofolic acid with D-(-)-glutamic acid, and 4-amino-pteroylaspartic acid.—*Sister Rose Agnes.* (Biological Abstracts)

SMITH, CHARLES F. AN ANALYSIS OF THE RESULTS OF THE EXAMINATION OF TWO HUNDRED STOOLS FROM CHICKENS. *Transactions of the Kansas Academy of Science, Vol. 52,* Dec. 1949, No. 4, page 454.—The results of examination of fifty additional stools of like material were compared with the results of examination of the gut of the same individuals.

Ova of *Ascaridia* and *Heterakis* were found in the stool and adults of each were found in the entrails.

Ova of *Capillaria* were found only in the stool, but no adult was found in the entrail.

One cestode, *Raillietina,* was detected in the gut but not in the stools.

When the results of examinations of single stools are corrected on the basis of autopsy studies, chickens of northeastern Kansas appear to be parasitized as follows: *Ascaridia,* 55 percent of the chickens; *Heterakis,* 48 percent; *Capillaria,* 5 or more percent. (Experiment Station Record)

TYLER, STANLEY W., RICHARD O. BROOKE, and WARREN S. BAKER. *(Wirthmore, Res. Lab., Malden 48, Mass.)* DETERMINATION OF SULFA QUINOXALINE AND SULFAGUANIDINE IN COMMERCIAL FEEDS. *Analyt. Chem. 21:* 1091-1092. 1949.—Alkaline extracts are treated with $NaNO_2$ and N-(1-naphthyl)-ethylendiamine HCl and the color measured photometrically. (Biological Abstracts)

BW, WARTIME WEAPON, HELPS COMBAT NEWCASTLE DISEASE. *Science News Letter, 58:* 121, August 19, 1950.—BW, dread wartime weapon which spells out as bacteriological warfare, is being turned to a peacetime use in Berkeley, California, by veterinarians seeking new ways to combat a serious, fast-spreading ailment of chickens, Newcastle disease.

Air saturated with a weak strain of the virus of Newcastle disease is fed to young chickens in special pens at the University of California. The disease spray, instead of striking down the chickens, makes them immune to more virulent forms of the Newcastle virus. (Experiment Station Record)

GOLDEN DRUG HELPS TURKEYS' SINUS TROUBLE. *Science News Letter, 58:* 104, August 12, 1950.—Sinus trouble in turkeys, an ailment different from that in humans, is the latest bane to fall before the golden-yellow antibiotic aureomycin.

Sinus infection in turkey flocks, although not normally fatal, slows the birds' rate of growth and often makes them unfit for market on time. (Experiment Station Record)

LEUKEMIAS MAY BE LICKED. *Science News Letter, 58:* 67, July 29, 1950.—Cortisone and a chemical which neutralizes folic acid may be the winning team against leukemias. Cortisone alone is not permanently effective. (Experiment Station Record)

MUTANT "SHAKER" GENE IDENTIFIED IN RHODE ISLAND REDS. *Progress in Solving Farm Problems of Illinois.* Report for 1947-48. page 62.—Chicks that are homozygous for the undesirable "shaker" gene appear normal up to three weeks of age, but start to quiver slightly thereafter. As they get older, the trembling becomes more violent and ultimately develops into complete ataxia. This severe incoordination prevents afflicted individuals from eating normally and they ultimately die as a result. (Experiment Station Record)

NO RELATION FOUND BETWEEN BODY TEMPERATURE OF CHICKS AND RESISTANCE TO PULLORUM DISEASE. *Progress in Solving Farm Problems of Illinois.* Report for 1947-48. page 63. —Mortality among the resistant chicks at 21 days of age had amounted to 6.7 percent as compared with 46.7 percent for the susceptible chicks. The three-day average body temperature of the resistant chicks was 102.7°F., and that of the susceptible chicks 102.9°F. This small difference was not significant. (Experiment Station Record)

SULFAQUINOXALINE. *Research for the Farmer,* June 1950, *62nd Annual Report Rhode Island Agr. Exp. Sta.* page 11.—Feeding sulfaquinoxaline in mash is known to help prevent the spread of the respiratory form of fowl cholera.

Smith, Wiley, and Delaplane fed a group of normal birds sulfaquinoxaline at the recommended dosage level of 1:3,000 for a period of time. One group received the drug with the laying ration while another received only the unmedicated ration.

The records kept showed only a small difference in production and hatchability between the pens. This difference could easily have been due to chance variations between the pens. From this, the researchers feel that there is no harmful effect in feeding the drug. (Experiment Station Record)

TOLERANCE OF SALMONELLA PULLORUM TO SODIUM SULFAMERAZINE. *Progress in Solving Farm Problems of Illinois.* Report for 1947-48. page 64.—Tests were made to determine whether cultures of *Salmonella pullorum* grown in increasing concentrations of sodium sulfamerazine acquired a tolerance to this drug, which under normal conditions is effective in reducing mortality among young chicks infected with the pullorum organism. The culture used in each test was produced from a single bacterium and divided into two subcultures—one to serve as a control and the other to be grown in the presence of sodium sulfamerazine. The final concentration of the drug for the treated culture was 200 milligrams in 100 cc. of medium.

Mortality was significantly greater among chicks inoculated with the culture which had been grown in the presence of sodium sulfamerazine. (Experiment Station Record)

WORM IN A BREAKFAST EGG. *The Jen-Sal Journal,* December, 1949, page 20.—"On several occasions, we have received, for determination, specimens of roundworms found in hen eggs. They invariably represent immature specimens of the large intestinal roundworms, *Ascaridia galli.* This one is a representative of this species. The large roundworm normally inhabits the small intestine of chickens and is a common parasite of this bird. However, for some reason not fully understood, individuals wander into the oviduct via the large intestine and cloaca. There they become enmeshed in the albumin of the developing egg prior to the formation of the shell." (Experiment Station Record)

POULTRY PRODUCTS AND MARKETING

ALMGREN, K. AGGLAGRINGENS PROBLEM OCH METODER. [PROBLEMS AND METHODS IN EGG STORAGE.] *Kungl. Lantbruksakad. Tidskr. 88:* 52-106. Illus. 1949.—The Storage Research Committee of the Agricultural Research Council is taking up investigations into egg-storage methods in use abroad and their applicability to Swedish conditions. The article begins with a survey of the morphology and chemistry of the egg. Classification and control are dealt with. An account is given of different methods of shell egg storage hitherto in use as cold storgae, the lime-water method, the water-glass method and new methods with plastic substances. Storage of egg contents such as drying, freezing and pasteurization is surveyed. An exhaustive account of pertaining literature is given.—*Ingrid Kiellander.* (Biological Abstracts)

BRADFORD, H. W. NORBEST ROLLS OUT TURKEY LOGS. *News for Farmer Cooperatives,* January 1950, Vol. 16, No. 10, page 3.—"Turkey log" is not a misprint for turkey leg. Rather it is the newest way Norbest Turkey Growers Association, Salt Lake City, is rolling out its turkey meat to the buyer.

Sold under the trade name Tur-King Boned Turkey, this product is boneless, compact, all-turkey meat, rounded into a long cylindrical package. It is made by neatly stripping the meat from the turkey bones. This meat then goes under a half ton of pressure which smoothly shapes it in the form of a log. Next, it is packaged in an aluminum foil wrapper and quick frozen. After cooking, it tastes like any other roast turkey . . . better, some say. (Experiment Station Record)

CARLIN, FRANCES. *(Iowa State Coll., Ames.)* THE EFFECT OF FREEZING ON TENDERNESS AND ON ICE CRYSTAL FORMATION IN POULTRY AFTER VARIOUS PERIODS OF AGING. *Jour. Home Econ. 41:* 516-517. 1949.—Eviscerated roasters and fowl (20 each) were aged 30 min., 1, 2, 6, and 24 hrs., then split in two. One of the halves was cooked at the end of the aging period, the other after being

frozen and stored for 24 hrs., and both halves tested for palatability. No differences in aroma or flavor were detected, but birds which had been aged and frozen were less juicy than those which had been aged only. Aging also decreased juciness. Histological studies of the fresh and frozen muscle fibers showed that the amt. of disintegration varied greatly from bird to bird, but was more extensive in the frozen than in the unfrozen halves. Vacuoles, assumed to have been occupied by ice crystals, were found most frequently in cooked muscle fibers of birds aged 30 min., 1 or 2 hrs. before freezing. Unfrozen birds tenderized rapidly, the tenderness increasing with aging time. Freezing increased tenderness markedly where halves had been aged less than 6 hrs. Birds aged 24 hrs. were not significantly affected by freezing.—*Olive Sheets.* (Biological Abstracts)

EVANS, ROBERT JOHN, J. A. DAVIDSON, and HELEN A. BUTTS. *(Michigan State Coll., E. Lansing.)* THE AMINO ACID CONTENT OF FRESH AND STORED SHELL EGGS. III. METHIONINE CYSTINE, AND LYSINE CONTENTS OF EGGS FROM HENS FED DIETS DIFFERING IN PERCENTAGE OF THESE AMINO ACIDS. *Poultry Sci. 29:* 104-108. 1950.—Laying hens were fed an all plant protein diet containing soybean oil meal as the only supplementary protein source. The percentages of lysine, methionine, and cystine in albumen or yolk proteins from the eggs laid by these hens were no different when either commercial solvent process soybean oil meal or the drastically autoclaved meal was included in the hen's diet or when lysine and methionine were added to the autoclaved meal. There was some indication that eggs from hens fed the autoclaved meal contained less lysine, methionine, and cystine than eggs of hens fed the unautoclaved meal or the autoclaved meal supplemented with methionine.—*R. J. Evans.* (Biological Abstracts)

FEVOLD, HARRY L., and ADELE L. DIMICK, *assignor to U.S. Sec. Agric.* ISOLATION OF LIPOVITELLENIN FROM EGG YOLK. *U.S. Patent 2,454,915; Appln.* May 21, 1947; Issd. Nov. 30, 1948.—Egg yolk is mixed with water, centrifuged, the solids dissolved, the liquid treated with ether to form 3 layers on standing, and the intermediate layer containing lipovitellenin removed. The lipovitellenin layer is ether extracted, washed with water, dialyzed and dried by lyophilization. The product is useful for specail feeding purposes such as for infant feeding. (Biological Abstracts)

JEFFREY, F. P., and C. E. WALKER. *(U. Massachusetts, Amherst.)* THE RELATIONSHIP BETWEEN EGG SHELL COLOR AND INCIDENCE OF COLORED MEAT SPOTS. *Poultry Sci. 29:* 244-247. 1950.—Blood clots and meat spots are distinct entities in the fresh laid egg. Genes controlling blood clots may not be the ones controlling the production of colored meat spots. By this study involving the examination of 19,032 opened eggs, it was shown that dark or medium brown eggs contain more colored meat spots and fewer white meat spots than do white or light brown eggs.—*F. P. Jeffrey.* (Biological Abstracts)

JOSH, GEORGE, LOUIS A. HARRIMAN, and ERVIN W. HOPKINS, *assignors to Armour and Co.* DRYING EGGS. *U.S. Patent 2,460,986;* Appln. Dec. 21, 1944; Issd. Feb. 8, 1949.—Egg white liquid is fermented with *Saccharomyces cerevisiae* and the fermented mixture dried. The removal of reducing sugars in this way is claimed to inhibit the development of off-flavors and odors. (Biological Abstracts)

KAHLENBERG, O. J. EGG SUBSTITUTES. *Baker's Digest. 24:* 16. 1950.—This paper is principally a review of published information on egg substitutes. It is essential that proposed egg substitutes possess all the qualities that are found in eggs. Tests made with Milei W and Milei G, produced from non-fat dry milk solids in Germany during the war, have shown that they are poor substitutes for eggs in the preparation of sponge goods. In comparisons with non-fat milk solids and dried

eggs, by the German method of making sponge cakes, Milei W was inferior to plain egg powder, and about equal to the milk solids. It may have some use as a foam-producing agent in meringue. Milei W is obtained from non-fat milk solids by treatment with lime and drying. Milei G substitutes consist of mixtures of non-fat milk solids and extracts of fruit seeds and kernels, or of milk proteins following treatments with emulsifying salts. They absorb water, and possibly have use in baking. Milei V's are whole egg substitutes. "Nachspeise" Milei consists of a mixture of Milei G and flavored corn, wheat or potato flour and Migette. The latter are rice-like alimentary pastes or soups. Soya whipping agents are not coagulated by heat and therefore do not hold water as firmly as egg albumin, and thus may yield unsatisfactory results when used for light foams of high moisture content, as in meringue powders. Another substitute for egg white, "Wiking Eiweiss," is made from fresh and dried codfish or steam-dried shrimp. It is reputed to possess superior whipping quality, but has a fishy flavor.—*R. H. Harris.* (Biological Abstracts)

MILLER, CORA *(Ohio U., Athens)*, and A. R. WINTER. *(Ohio State U., Columbus.)* THE FUNCTIONAL PROPERTIES AND BACTERIAL CONTENT OF PASTEURIZED AND FROZEN WHOLE EGGS. *Poultry Sci. 29:* 88-97. Illus. 1950.—Pasteurization of liquid whole egg at 140-142° F. for 4 min. killed more than 99% of the standard plate and coliform bacteria. Pasteurization before freezing reduced the viscosity of frozen defrosted whole egg. Pasteurization and freezing increased the stability of whole egg foam. The beating time required for pasteurized frozen egg meringue was about 17% longer than for unpasteurized frozen meringue and about 8% longer than for meringue made with shell eggs. Pasteurization and/or freezing whole egg had no significant effect on sponge cake, baked or stirred custard, or egg scramble quality.—*A. R. Winter.* (Biological Abstracts)

MILLER, DWIGHT P., RAYMOND E. CRAY, and E. L. DAKAN. *(Ohio Agric. Exp. Sta., Wooster.)* MARKETING EGGS ON A GRADED BASIS IN OHIO. *Res. Bull. Ohio Agric. Exp. Sta.* 693. 1949.—Study of the development of graded egg buying in Ohio and the reaction of producers to the practice of selling eggs on a graded basis. Continuity of the sale of eggs by producers to 5 grading stations during their first 6 yrs. of operation was detd. Reasons for discontinuing the practice of selling on a graded basis were tabulated by actual visits to producers. Production practices prior to selling on a graded basis and after changing back to selling on a non-graded basis, were studied. The practice of selling eggs on a graded basis was studied in relation to the size of flock, the quality and size of eggs produced and the period of time involved in reaching the optimum proportion of top quality eggs.—*R. E. Cray.* (Biological Abstracts)

MILLER, M. WAYNE, V. JOUKOVSKY, and ALBERT KRAGHT. *(Washington Co-op. Farmers' Assoc., Seattle.)* EXPERIMENTS RELATING TO THE SPOILAGE OF WASHED EGGS. *Poultry Sci. 29:* 27-33. 1950.—In a series of 8 egg-washing expts., it was found that spoilage in washed eggs was due to bacterial contamination that occurred when eggs were washed. Washing in clean running tap water did not result in spoilage. When wash water contained inoculum prepd. from black-rot eggs, the washed eggs spoiled within 2.25-4 weeks at room temp. This spoilage was manifested as rotten eggs or by high bacteria count of normal-appearing broken out eggs. Attempts to prevent spoilage by disinfecting the eggs after washing were unsuccessful. Pasteurization of washed eggs or washing eggs in liquid maintained in sterile condition by heat at 150° F. or disinfectants prevented spoilage.—*M. W. Miller.* (Biological Abstracts)

NEWELL, GEORGE W., and C. S. SHAFFNER. *(U. Maryland, College Park.)* BLOOD LOSS BY CHICKENS DURING KILLING. *Poultry Sci. 29:* 271-275. 1950.—The amt. of blood lost by groups of

chickens bled by different methods was detd. and this value related to the estimated total blood volume of these birds. The birds lost 35-50% of their total blood volume during the bleeding phase of the killing operation. With broilers, this corresponds to approx. 4% of the live wt. "Kosher"-killed birds and birds which were stuck and debrained lost significantly larger percentages of the blood in the body than did birds which had been decapitated. Males and females lost approx. the same percentage of the blood in the body when killed by any of the 3 methods tested. Epinephrine injns., extremes in environmental temps., and the breathing of pure oxygen prior to killing were ineffective in increasing the percentage of blood lost or improving the appearance of the dressed carcass of chickens. The amt. of blood lost was more closely associated with total blood volume than with body wt.—*C. E. Shaffner.* (Biological Abstracts)

VINE, VERNON, BLOCK-BUSTER CHICKENS. *Farm Journal.* September 1950. page 41.—Just five years ago, a few men with an idea took a good-looking chicken carcass and pumped it up until it was nearly square. Then they cast it in wax. They called it the "Chicken of Tomorrow," and challenged the nation's poultrymen to produce something like it.

This year some 50 million birds that come close to hitting the goal set by that wax model are being raised on U.S. poultry farms. Some birds actually exceed the model's measurements.

These birds—called superior meat-type chickens—have amazingly deep, broad breasts, and drumsticks the shape of bowling pins.

When they go to market, ready for pan or broiler, packaged in transparent plastic, and sold in self-service freezer display cabinets, they're providing plenty of competition for red meat. (Experiment Station Record)

YOUNG, H. E. *(Dept. Agric., Brisbane, Queensland, Australia.)* BLUESTAINED CASE TIMBER AND MOULD ROTS IN HEN EGGS. *Queensland Jour. Agric. Sci. 5:* 141-147. 1948.—Mold rots in eggs can be artificially produced by infection with spores of a sap-staining fungus, *Trichoderma lignorum.* Early treatment of eggs with the Na salt of salicylanilide was an effective preventative of decay caused by molds but was ineffective against bacterial rots. Under normal export conditions cases made of bluestained hoop pine, *Araucaria cunninghamii,* lumber have no effect on the quality of eggs packed therein for export.—*C. T. Schmidt.* (Biological Abstracts)

YUSHOK, W. D. *(Nation. Res. Council, Washington, D.C.),* and ALEXIS L. ROMANOFF. *(Cornell U., Ithaca, N. Y.)* PREVENTION OF MOLD GROWTH IN INTACT EGGS BY TREATMENT WITH A CATIONIC DETERGENT. *Food Res. 15:* 1-7. 1950.—Eggs stored at relative humidities between 98 and 100% and at room temperature develop shell-adhered yolks and heavy external growth of molds within a 20-day period. During further storage, prolific mold growth develops within the eggs. To some extent molds grow on eggs coated with any of the following substances: mineral oil, polystyrene chlorinated rubber, and polyvinyl acetate. Dipping eggs in a 0.5% aqueous soln. of cetyl pyridinium chloride prior to storage completely prevents development of molds on eggs. Cetyl pyridinium chloride exhibits its fungicidal properties also when properly incorporated into a film of polystyrene, polyvinyl acetate, chlorinated rubber, or mineral oil.—*W. D. Yushok.* (Biological Abstracts)

PRACTICAL WASHING STUDY. *Poultry Tribune, December,* 1949, 55: 56.—The eggs were divided into four lots of 60 dozens each prior to treatment. Two lots were cleaned by wiping them with a damp cloth. Two were cleaned by hot water washing in a machine which exposes the eggs to whirling cloth pads for about 22 seconds at 150-160 degrees Fahrenheit.

One damp cloth-cleaned lot and one machine-cleaned lot were stored as natural shell eggs; the other two lots were shell treated with oil (the Vineland market has oil processing equipment, and shell treats a large volume of storage eggs for its customers).

The machine-washed eggs stored in natural shells yielded more A-quality than the damp rag cleaned eggs, but these results were reversed in the oil-processed lots.

There was little difference in the number of inedible eggs in the four lots, averaging less than two percent, the highest being 2.08 percent of the machine-washed natural shell eggs. However, Lambert noted that practically all inedible eggs among the machine-washed lots were rots of various types. "Stuck yolks," a less hazardous fault, were the principal cause of inedibility among the stored eggs which had been cleaned with a damp cloth. (Experiment Station Record)

MANAGEMENT

AVERY, T. B. *(Kansas State College, Manhattan.)* HOW HENS PERFORM IN AN IDEAL ENVIRONMENT. *Transactions of the Kansas Academy of Science 52:* 468, 1950.—The three environmental factors considered are temperature, humidity, and length of day. In room 1, these three factors are allowed to fluctuate normally with the season. Room 2 is designed so that the temperature and humidity fluctuate with the season, but the birds are given equal periods of artificial daylight and darkness. Room 3 is equipped so that the temperature is maintained uniformly throughout the year at 65° F. The moisture is maintained at 65 percent relative humidity, and there are equal periods (12 hours) of artificial daylight and darkness.

It was shown that hens kept under the ideal environment in Room 3 laid only a few more total eggs during the year than did those in Rooms 1 and 2. It was demonstrated, however, that hens in Room 3 did not go into a slump during periods of very hot or very cold weather, as did the other two rooms. They also laid more eggs during the fall months, but laid fewer eggs during the spring peak, a time when most hens lay at the highest rate. There tended to be a rather consistent difference in egg size between the three rooms. Hens in Room 3 laid smaller eggs during the fall and winter months, but laid larger eggs during the summer months than did birds in the other two rooms. Birds in Room 2 laid eggs that were intermediate in size between those of Room 3 and Room 1. The shell thickness varied a great deal with the season in the two uncontrolled pens, while it remained fairly constant in the controlled pen.

Hens kept in the uncontrolled room (Room 1) molted in the same manner that hens usually molt, while those birds kept under constant conditions delayed the molt until much later in the fall and did not molt as heavily. Birds in Room 2 were intermediate in their molt between those in Rooms 1 and 3.

Although mortality varied among the rooms from year to year, there appears to be no consistent difference by rooms so far as death loss is concerned. (Experiment Station Record)

BRESSLER, G. O. *(Pennsylvania State Coll., State College.)* AN ECONOMIC ANALYSIS OF LABOR-SAVING METHODS AND FACILITIES ON POULTRY FARMS IN PENNSYLVANIA. *Poultry Sci. 29:* 184-189. 1950.—Time and travel records of daily chores were made before and after certain changes in methods and facilities on 12 commercial poultry farms. Changes were: removal of partitions; rearranging feeders and nest; installing feed tracks, feed chutes, automatic watering systems and automatic mash feeders. The cost of making changes was related to time saved in terms of dollars and number of days required to pay for any change. Egg production, mortality and culling before and after specific changes were compared. Removing parti-

tions saved time and travel in feeding and egg gathering; the value of time saved quickly paid for the cost. Grouping nests near pen entrance doors seemed to be more satisfactory than a nesting room arrangement. Feed chutes usually saved time. When considering total feeding time, including filling of feed bins, no time advantage was gained on one farm where feed chutes were installed. Time required for feeding mash and pellets was eliminated by an automatic feeder. Since feed bins required filling only every few days, considerable flexibility was possible in the feeding chores. None of the labor-saving changes had any adverse effect on egg production or livability.—*G. O. Bressler.* (Biological Abstracts)

BRESSLER, G. O., D. C. SPRAGUE, and A. S. MOWERY. *(Pennsylvania State Coll., State College.)* CAN MECHANICAL METHODS OF FEEDING POULTRY REPLACE HAND METHODS? *Poultry Sci. 29:* 176-183. Illus. 1950.—An automatic mash feeder was designed. Two groups of random-selected layers were fed mash automatically and two similarly selected groups were hand-fed. The mechanically-fed groups were fed mash automatically every hr. during the day by time clock control; scratch grain was fed in the evening by hand. The hand-fed groups were fed mash daily in the morning and scratch grain in the evening. At the beginning of the 9th week hand-fed groups were fed pellets in addition to the mash and scratch to encourage feed consumption; also, at the beginning of the 27th week condensed buttermilk was fed to the hand-fed groups to further stimulate feed consumption. The mechanically-fed groups received only mash and grain during the entire 7-month test. The results of the test showed no significant difference in feed consumption, egg production, body weight or mortality. Field installations of automatic mash feeders for layers and broilers are discussed from the stand-point of labor saved and cost of installation and operation.—*G. O. Bressler.* (Biological Abstracts)

HALDINGTON, E., and J. H. GULLIFORD. TABLE POULTRY EXPERIMENTS AT HAWKESBURY AGRICULTURAL COLLEGE. *Agric. Gaz. N. S. Wales 60:* 497-500. 1949.—To compare the cost of rearing Australorps and White Leghorns to a marketable age of 12-16 wks., and also to compare the battery system of rearing with ordinary methods, an expt. was carried out at Hawkesbury Agricultural College. The expt. began on Aug. 27, 1948, with 800 sexed day-old cockerels (400 Australorps and 400 White Leghorns) and concluded on Dec. 17, when the birds were 16 wks. old. The results showed that although there was no appreciable difference in the cost of feeding by the 2 systems, and in the return over cost of feeding in the case of White Leghorns, there was a decided advantage in favor of ordinary raising methods in return over feeding cost in the case of Australorps.—*A. J. Loustalot.* (Biological Abstracts)

HAMMOND, JOHN C. *(O. A. Newton and Son Co., Bridgeville, Del.)* SOME EFFECTS OF THE POULTRYMAN AND HIS MANAGEMENT ON THE EFFICIENCY OF BROILER PRODUCTION. *Poultry Sci. 29:* 293-298. Illus. 1950.—Data accumulated in 40 share broiler accounts were analyzed to compare the production efficiency of the different growers. Each grower was represented by 7-9 flocks sold during the period between May 1943 and Nov. 1945. The brand of feed and source of chicks was the same in all cases. Highly significant differenc s were found among growers for the total cost per pound of meat sold and for its two principal contributing factors, (a) % mortality and (b) pounds of feed required to produce a pound of meat.—*J. C. Hammond.* (Biological Abstracts)

HENDERSON, D. C. *(U. Vermont, Burlington.)* RADIANT OR PANEL HEAT FOR BROODING CHICKS. *Poultry Sci. 29:* 299-304. 1950.—A floor-heated pen was included in the new poultry plant completed at the Univ. of Vermont in 1947. The floor was constructed as

follows: (a) Two separate coils of 1.25-inch welded pipe spaced 12 inches apart on center, with headers of 2-inch wrought iron; (b) a fill of coarse gravel; (c) coils imbedded in concrete; (d) entire system tested for leaks before concrete was poured. The temp. in the floor-heated pen has been more uniform than the individual canopy-heated pens. Crowding has been reduced to a minimum and growth and performance have been satisfactory. Litter remains uniformly dry and pens are easily cleaned. However, floor heating has not eliminated coccidiosis.—*D. C. Henderson.* (Biological Abstracts)

IYER, S. G. and S. NARAYANAN. USEFUL SPAN OF LIFE OF THE FOWL IN INDIA. *Indian Farming. 11(2):* 62, February 1950.—No changes in the strain of the three breeds—White Leghorn, Rhode Island Red and the improved indigenous *(Desi)* pullets—were made during the experimental period (1944-48) in order to avoid any possibility of getting variable results by the introduction of fresh blood.

The production in the second year in general was quite satisfactory and in several instances the retention of layers for a full period of two years from the date of the first egg was justified, the birds paying for their maintenance. The average economic life of a hen in India, therefore, seems to be two years though individuals may lay well in the third year also rendering them most efficient breeders. (Experiment Station Record)

KENNARD, D. C. and V. D. CHAMBERLAIN. GIVE BUILT-UP LITTER A CHANCE TO FUNCTION. *Ohio Farm and Home Research,* July-August 1950, 35: 53.—Built-up litter functions best as a sanitary procedure when:

Kept at a sufficient depth of 6 to 12 inches.

Stirred to prevent its caking over the surface and to mix the fresh droppings and polluted surface material with that below where sanitation takes place.

Moisture and heat are available as usually provided in reasonably well insulated houses without artificially heated floors.

Any of the materials commonly used for floor litter such as chopped straw, wood shavings, sawdust, ground corn cobs, oat or peanut hulls, cane and peatmoss can be used to start a built-up litter. The principal requirement is that the litter material be sufficiently fine to stir easily and that a sufficient amount of the material be used at the start.

Built-up litter gives rise to some special housing problems. There should be from 8 to 12 inches additional height of the ceiling to make room for the extra litter. In frame structures, the foundation should be carried 3 or 4 inches above the surface of the litter when at full depth to prevent deterioration of foundation sills.

With built-up litter, there comes a trend back to earth floors. The primary purpose of a concrete floor in connection with fresh litter was to have something permanent to clean, scrub and spray. In upper floor structures a wood floor is generally the most practicable and under built-up litter, should last many years. (Experiment Station Record)

MANUEL, A. B. *(University of the Philippines, College of Agriculture, College, Laguna).* OBSERVATIONS ON THE RANGE HABITS OF GROWING CHICKS. *The Philippine Agriculturist, 33:* 28-35. 1949. —This study was conducted for the purpose of observing the different activities and pasture habits of chicks, a knowledge of which would help satisfy the requirement the chicks need, thereby increasing the efficiency of production. The different activities observed were the following: (a) feeding; (b) drinking; (c) idling or standing, or walking about without any apparent purpose; (d) scratching and picking; (e) running around, flying, or fighting; and (f) staying in the shade. Two lots of chicks were observed, naturally and artificially brooded lots. It was observed that, in both lots, the chicks began to go out on the second day of brooding. During the first week, the majority of the chicks that went outside the house were within a 3-meter radius from it. On the second week, however, the naturally brooded chicks reached beyond the radius of 15

meters from the house, while the artificially brooded chicks reached beyond this radius only during the third week. In both lots, more birds were outside the house at 6:00 and 9:00 o'clock in the morning and at 6:00 o'clock in the afternoon than at 12:00 o'clock noon and 3:00 o'clock in the afternoon. Also, more birds were outside the house during rainy days than during hot days. More birds were feeding in the mash troughs, idling about, scratching and picking, and running around at 6:00 and 9:00 o'clock in the morning and at 6:00 o'clock in the afternoon than during the other hours of observation. A considerably large number of birds outside the house at different hours of the day were feeding in the mash troughs and they kept doing so as long as there was sufficient light for them to see.—*F. M. Fronda*

MORENG, ROBERT E., and NORMAN E. PHILLIPS. *(U. Maryland, College Park.)* THE EFFECT OF VARIOUS DEGREES OF CHILLING ON MORTALITY AND GROWTH OF BABY CHICKS. *Poultry Sci. 29:* 310-312. 1950.—400 New Hampshire chicks were divided into comparable groups of 20 birds each, and chilled on day of hatch, 1 day after hatch, and 2 days after hatching. This was done by placing each chick in an individual basket, to prevent huddling, and then exposing them to 37 F (2.78°C) for various lengths of time (25, 50, 75, 100, and 125 min.). From the data collected, it appears that the poikilothermic characteristics of the chick at hatching time enable it to withstand severe chilling for short periods. Severe chilling for short periods was not detrimental to growth, whereas mild chilling over long periods is generally known to be detrimental.—*R. E. Moreng.* (Biological Abstracts)

PARKER, J. E. *(Oregon Expt. Sta., Corvallis.)* THE EFFECT OF RESTRICTED MATING IN FLOCKS OF NEW HAMPSHIRE CHICKENS ON FERTILITY AND HATCHABILITY OF EGGS. *Poultry Sci. 29:* 268-270. 1950.—In breeding flocks of New Hampshire chickens in which several methods of restricting their mating were studied with respect to fertility and hatchability, it was observed that none of the methods studied increased the percentage of fertile eggs laid over that of a control flock in which no attempt was made to restrict the time of mating. Restricting mating to the afternoon gave comparable results to unrestricted mating, but restricting mating to the morning or dividing the breeding males into 2 groups and restricting mating to alternate afternoons decreased fertility. Restricting mating to the afternoons increased the hatchability of fertile eggs and of all eggs set, whereas restricting the mating to mornings tended to decrease hatchability.—*Auth. abst.* (Biological Abstracts)

PAULINO, L. A. *(University of the Philippines, College of Agriculture, College, Laguna).* EFFECTS OF VARYING LENGTH OF ILLUMINATION ON THE RATE OF GROWTH AND MORTALITY OF CHICKS. *The Philippine Agriculturist, 33:* 63-71. 1949.—A total of 381 New Hampshire chicks were divided into three equal lots. One lot, Lot I, received normal daylight only, in another lot, Lot II, artificial light was put on daily at sunset for two hours, and in the third lot, Lot III, artificial light was put on daily at sunset for four hours. All three lots received identical treatment. It was apparent from the results obtained in this study that lengthening the day or the period of illumination by the use of electric light does not have any beneficial influence on the growth of chicks. At the weaning age of twelve weeks, the chicks given normal daylight were significantly heavier than those which received normal daylight plus four additional hours of electric light. There was no significant difference between the weight of the chicks given normal daylight only and those given an additional two hours of artificial illumination. The birds in the lot that were given four additional hours of artificial illumination were poor in vitality, the lot had the highest mortality of the three, and both the artificially lighted lots required a greater amount of feed to produce a kilogram gain in weight. The returns above the cost of feed and lighting were much higher in the normally lighted lot than in the

lot that received normal daylight plus two hours of artificial light. The lot that received four additional hours of artificial illumination after sunset incurred a loss.—*F. M. Fronda.*

REED, FRANK D. RAISING HENS IN 2 SHIFTS. With low-cost laying shelters you can keep double your flock when egg prices are high. *Farm Journal.* August. 1950. page 35.—

Laying shelters are mainly "extra" housing for "extra" hens in mild weather months when you don't need all-weather housing.

Laying shelters cost just about one-half of regular laying houses. (*Farm Journal's* plan calls for a house 30 feet wide, and 60 feet long, which can be lengthened indefinitely in 15-foot units. Pole-frame construction keeps costs down.—Ed.)

There are two systems for using these shelters.

Either system calls for a two-hatch schedule. Both of them make extra use of brooder facilities. And both call for "doubling up" the laying flock during the summer and fall months when egg prices are highest. (Experiment Station Record)

SMITH, S. B. and W. H. WILEY. IS BROODER HOUSE INSULATION PROFITABLE? *Research for the Farmer,* June 1950, *62nd Annual Report Rhode Island Agr. Exp. Sta.* page 11.—

Birds in the non-insulated houses feather a little more rapidly and seem to gain a little more weight than those in the insulated houses. However, value of this extra weight is more than offset by the extra cost of heating the non-insulated house.

More condensed moisture formed on ceiling and walls of the non-insulated pens. There were no consistent differences in mortality between the 2 types of houses. (Experiment Station Record)

WILSON, WILBOR O. *(U. California, Davis.)* CHICKENS IN HOT WEATHER: EFFECTS OF HIGH AIR TEMPERATURES AND METHODS OF COOLING POULTRY HOUSES UNDER STUDY. *California Agric. 3(5):* 11, 15. Illus. 1949.—The non-sweating chicken is intolerant of high temps. Egg size reduction and shell-thinning began at 70° F, water consumption increases at 75°F, the hen begins to pant and the body temp. (normal 106-107°F) begins to rise at 80°F. Feed consumption is reduced and the hen loses wt. at temps. above 80°F. When the air temp. remains for 8 hrs. or more at 100°F or higher, some hens will die of heat prostration. Methods of cooling poultry houses are under study.—*Guy W. Bohn.* (Biological Abstracts)

GENERAL

FLOREA, J. H. WINNERS IN THE LAYING TESTS. *Poultry Tribune 55(10):* 12, 64-69. 1949.—Final report on egg laying tests covering period Oct. 1, 1948, to Sept. 22, 1949. 19 standard breeds and various crosses represented. 156 S.C.W. Leghorns, bred by Babcock Poultry Farm, Ithaca, N. Y., averaged 273.5 eggs and 287.9 points. Livability was 94.2%. 2d, 3d, 4th, and 5th places were won by breeders of S.C. Rhode Island Reds.—*F. P. Jeffrey.* (Biological Abstracts)

HOFFMANN, EDMUND, and ROBERT S. WHEELER. *(U. Georgia, Athens.).* THOUGHT QUESTION—DISCUSSION TECHNIQUE IN TEACHING INTRODUCTORY POULTRY HUSBANDRY. *Poultry Sci. 28:* 446-449. 1949.—The authors present their ideas on teaching techniques and their effectiveness in the class room on students. It is an excellent presentation of one method of teaching poultry husbandry. —*Lawrence Morris.* (Biological Abstracts)

PLATT, CLARENCE S. *(Agric. Expt. Sta., New Brunswick, N. J.)* TEN YEARS OF STANDARD EGG LAYING TESTS IN THE UNITED STATES. *Poultry Sci. 28:* 363-371. 1949.—A summary of 10 yrs.' egg-laying tests, showing the rise and decline in entries of the various breeds, also origin by states, mortality, egg size; variations in egg production by breeds; and other interesting and valuable data for poultry breeders. The most popular breeds were White Leghorn, Rhode Island Reds and Barred Plymouth Rocks, New Hampshires and White Plymouth Rocks. The New Hampshires increased in popularity during the 10-yr. period, while White Leghorns decreased, but the White Leghorn was still the most popular breed in 1946 and 1947. Mortality decreased from 20.9% in 1937-38 to 13.9% in 1946-47. Egg production per hen also showed a steady increase—*Lawrence Morris.* (Biological Abstracts)

SOUTAR, D. S. *(N. Scotland Agric. Coll.)* HOUSING THE FARMER'S HENS. *Scottish Agric. 29:* 150-155. Illus. 1950.—This describes the methods of building and planning suitable houses for hens, including designs for transport on wheels or skids, lighting, ventilation, roosts, nests, doors and feeding facilities.—*C. E. Foister.* (Biological Abstracts)

TAYLOR, L. W., et. al. *(U. California, Berkeley.)* POULTRY HUSBANDRY REPORT, 1948: A BRIEF PROGRESS REPORT ON RESEARCH FINDINGS BY THE STAFF OF THE DIVISION. *California Agric. 3(4):* 7-8. Illus. 1949.—The breeding program, feeding expts. and light and temp. expts. with chickens and turkeys are briefly discussed. Artificial insemination expts., with turkeys and the dirty egg problem in chickens are also mentioned.—*Guy W. Bohn.* (Biological Abstracts)

WILSON, WILBOR O. *(U. California, Davis.)* INTERNAL TEMPERATURES OF CHICK SHIPPING BOXES AS INFLUENCED BY ENVIRONMENTAL TEMPERATURES. *Poultry Sci. 29:* 276-284. 1950.—The temp. inside the chick boxes was measured by means of thermocouples at several locations when the boxes were filled with baby chicks. The relation of this temp. inside the box and environmental temp. of 35°, 70° and 100°F was studied. Other conditions studied were the number of holes to open and various sizes of chick boxes. Under the conditions of the expts. chicks seemed to suffer more from over-heating in chick boxes than from chilling. At low environmental temps. the chicks huddle to the inside corner of the compartment to conserve body heat. Small differences were observed between the temps. inside the top and the bottom boxes when the boxes were tied together in the customary manner for shipping. Larger chick boxes are needed for summer conditions in order to help eliminate the excessive amt. of heat produced by the metabolism of the baby chick.—*Author.* (Biological Abstracts)

Note:

The Experiment Station Record, published by the Office of Experiment Stations, United States Department of Agriculture, was discontinued as a publication several years ago. References to "Experiment Station Record" in some of the items of this abstract material, therefore, refer not to the publication of this name but to the records kept by the Office of Experiment Stations.

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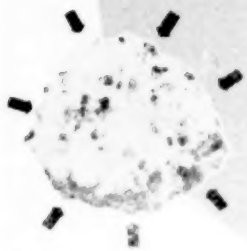

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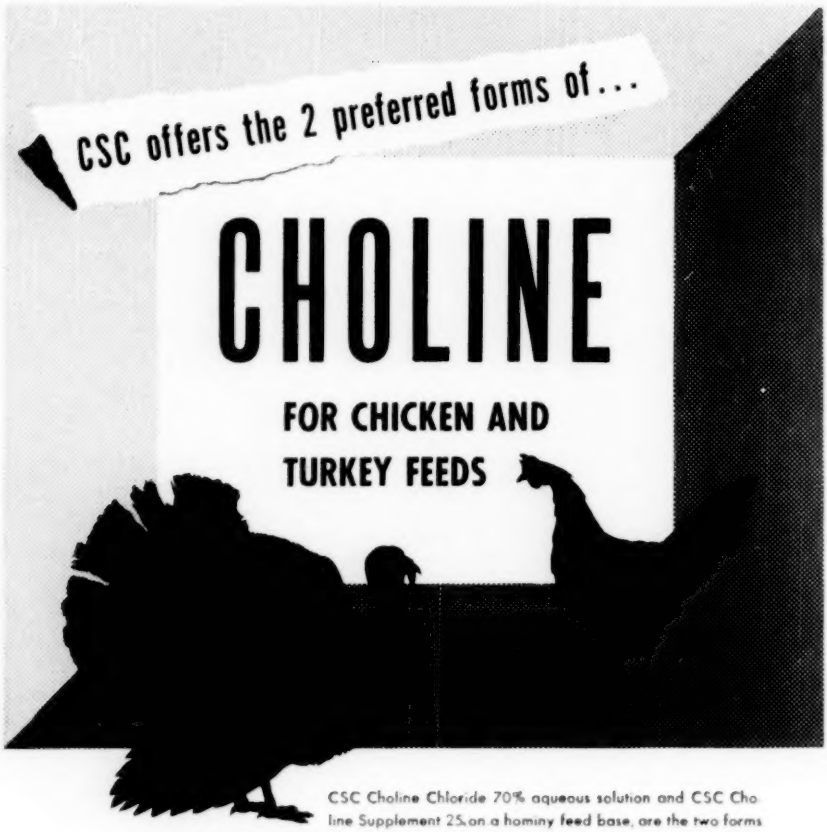

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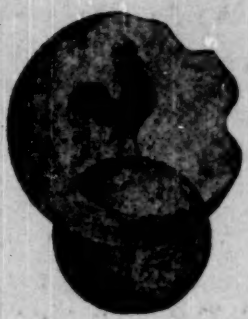

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